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Ore Sampling by Machines

Conditions Necessary to Accurate Sampling. Disturbing Effects of Uncontrolled Gravitation. Control of Feed Would Be a Valuable Novelty

BY JOHN A. CHURCH*

In the JOURNAL of May 9, 1908, there were illustrations of the Great Cobar sampling mill, which, as well as can be judged in the absence of a detailed description, seems to be a good example of the prevailing design of such works. It is so good in fact as to offer a favorable opportunity for considering the operation of such establishments, and whether their arrangement is really the best that can be chosen. In this day of careful study of every branch of mining work it is unnecessary to offer excuses for my interest in this important branch.

The arrangement of the Great Cobar works is very common and is intended to meet the conditions of railway transport, heavy carloads and machinery, and a large supply of ore. The first crusher, of course the heaviest piece of machinery installed, is placed on or near the ground and its product is raised by belt elevator with about 60 ft. lift, to the top of the building, and falls first to a bin and then to a sampler. From this bin the ore falls through samplers and crushers alternately until the last cut, 1/1500 of the original ore, reaches the ground level. The works are planned to treat ultimately a mine output of 2,000 tons daily. Every fifth car goes to the sampling works which will receive 400 tons a day. I propose to examine the conditions which govern the passage of ore through a mill of this kind.

RETARDATION OF COARSE MATERIAL

The first crusher is a No. 5 McCully gyratory, set probably to 2 or 2½ in. discharge. (This and other details are not mentioned in the description, and where necessary I introduce figures that suit the magnitude of the operation.) The crusher receives, presumably in 10 hours, 400 tons, or 1333 lb. a minute, of ore which has been crushed previously to 6 in. All ore goes through it, and in this machine we find the first operation of one condition which is probably inimical to perfect sampling. I refer to retardation of part of the ore which results in separating one portion of the ore thrown into the crusher at one time from another portion.

Some of the ore is fine enough to pass through without change, while other portions are held back by the machine until they have been broken up. This is most noticeable in the first crusher, with its wide discharge opening. Probably one-half the ore is fine enough to go through without further reduction. Therefore 667 lb. runs through, some freely, some with slight detention, but most of it in advance of the ore coarse enough to require crushing. There is a noticeable difference even among the larger pieces, for with ore passing through at the rate of 11 lb. per second a 6-in. piece weighing 11 lb. will remain longer than a 3-in. piece weighing 1½ lb. The subject can be treated only in a general way, for each large piece chokes the crusher locally for a time and may hold back some fines. On the other hand, the crushing hight of a No. 5 machine is only 2 ft., so that when the path is free the fines can rush through with speed. On leaving the crusher retardation of the contrary kind takes place from the operation of another cause which is operative at every machine in the mill. Crusher spouts are inclined usually 50 or 55 deg., but even with that slope the finest ore does not go down with the speed of the coarse. It suffers retardation due to friction.

The real work of sampling begins with the bin into which the elevator discharges. The first sampler is a Simplex of 64 in. diameter, making 11 r.p.m. This sampler consists of a wheel on which two scoops are fixed on opposite ends of one diagonal. The ore comes down a chute and falls continuously to a lower chute leading to the reject bin, except when the whole stream is diverted to the sample by the passage of a scoop under the feed chute. The fall from the bin to the sampler is about 2 ft. 10 in., and the chute appears to have a slope of 58 deg. Retardation of the finer stuff is repeated here while the coarse rushes away from it. In fact, when a chute of this slope is not covered, it is common to see the larger fragments bound off at the top and make the rest of their fall in free air, while smaller sizes are retarded more or less according to size and density. Even the free fall in air of such mixed material is not the same on account of the great difference in surface and friction. A cubic foot of ore has its surface increased about 10 times when broken to pieces that will pass a 2-in. ring, more than 20 times for 1 in. and more than 40 times for ½ in., figures that indicate how great the increase is for still smaller sizes which are always our especial care in accurate sampling. While such calculations are vague, they impress upon us the fact that the retarding effect of friction increases as the kinetic value or weight of the fragment decreases, and a sampling mill is an excellent place to observe how positive and important this relation of size to movement is. Remembering that there is retardation whenever ore is transferred from one machine to another, we have the following repetitions of this action in the mill under consideration, after the elevator bin.

Elevator bin to No. 1 sampler	2 ft. 10 in.
No. 1 sampler to No. 2 crusher	4 ft. 0 in.
No. 2 crusher to No. 2 sampler	4 ft. 4 in.
No. 2 sampler to 1st rolls	8 ft. 0 in.
1st rolls to No. 3 sampler	2 ft. 0 in.
No. 3 sampler to 2d rolls	3 ft. 6 in.
2d rolls to No. 4 sampler	2 ft. 0 in.

EFFECT OF RETARDATION UPON THE WORK

The mode in which this partial retardation affects the work may be understood by studying the operation of the machines. In the simplex 64-in. sampler the stream of ore strikes the scoop at a mean distance of nearly 23½ in. from the center, giving a sampling circle of 147 in. circumference and with 11 r.p.m. the speed in this circle is 27 in., nearly, per second. For a 15-per cent. cut the scoop has a width on this circle of 11 in. and crosses the ore stream in 0.41 second. Assuming that, under whatever circumstances of retardation exist, the fall of the largest fragment occupies 0.5 second from the bin, and it enters the scoop squarely in the center, a movement of 5.5 in. will carry the scoop beyond the stream of ore. This will be done in 0.2 second, so that if a small fragment that left the bin with the large piece is retarded only 0.2 second it will not go into the sample with its former neighbor but will go to the reject. This separation of large and small pieces that began their progress together is repeated seven times in this mill as we have seen.

It may be thought that I am emphasizing too strongly the effects of gravity upon sampling, diminished as it is by the small spaces into which the fall is broken,

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but one who watches the operation of sampling mills must acknowledge the positive character of this separation. In one works the mistake was made of giving the elevator a lift of 90 ft. and the drop between the various machines was so great that acceleration of gravity had full force and the larger fragments came down like bullets while the finer ore that should have accompanied them did not appear for seconds after. The superintendent said that the only good sampling he did was in the last step, which was preceded by rolls that were fed by a shaking apron. In another mill the sampler was set so far in advance of the chute that acceleration was actually depended upon to carry the ore over the gap! No wonder the manager was doubtful whether "mechanical sampling" was worth anything.

It is possible to correct, or at least to minimize the effects of retardation, but before advocating anything of the kind it will be well to consider the actual results of the present system and whether they are inimical to good sampling.

In hand sampling it is considered necessary to mix the sample thoroughly before coning, and though the particles do not fall alike in coning care is taken that whatever forces act on the different sizes shall be distributed equally on all sides of the cone, so that a cut taken anywhere from center to circumference will include all results of the coning. Separation of coarse and fine to different parts of the cone or to different times of sampling is not allowed and this is the main difference between hand and mechanical work.

Effect of Haphazard Retardation

In mill sampling the first question that arises is whether the practice of throwing all the ore, coarse and fine together, into the crusher hopper produces the good effects that are expected from it. There is a strong prejudice among practical men in favor of this practice, but I have shown that it does not prevent the dissociation and separate sampling of particles that enter the crusher together. If the fine were screened out and remixed with the coarse on the crusher spout the effects ought to be much the same except in one particular. By putting all through the crusher together, coarse and fine go through in due proportion but not necessarily in the same unit of time.

The second question is what effect does haphazard retardation have upon the operation of a sampler. I believe it to be bad and as the evil lies in the improper presentation of the ore to the machine I do not believe one sampler has any superiority over another in this respect. That is to say, not one of them can cure an evil that was completed before the ore reached the sampler. We now have machines that treat the stream of ore with uniform fairness. So far as their work is concerned we may say that not one grain goes into the sample that belongs in the reject and *vice versa*, but they have no power to correct errors.

Accuracy of Sampling

Having shown that there is a force operating effectively in all sampling works which has not been taken into account in the design of such works the third question to be considered is what effect this action has upon the accuracy of sampling. We owe to Paul Johnson the most valuable contribution on this subject. He published in the Journal, April 12, 1902, a table giving the comparative results of sampling and resampling 11 lots of ore, four of which contained gold and silver and seven had copper, gold and silver. The work was done in samplers of his own design, which have approved themselves in other places as well as in his mill. The result is summarized in Table I which has been calculated to exhibit the difference between the two samples and not the variation from a mean. The percentages are calculated on the higher assay so that each difference is represented as a deficiency.

TABLE I.

	Copper, %.		Gold, Oz.		Silver, Oz.	
	A	*B*	*A*	*B*	*A*	*B*
Total of assays	21.73	21.56	2.615	2.480	50.47	51.25
Mean	3.10	3.08	0.238	0.225	4.59	4.66
Difference	.....	0.02	.....	0.013	0.07	.....
" per cent.	0.64	.....	5.46	.....	.. ...	1.5

The table shows that in sample *A* the copper was 0.64 per cent. and the gold 5.46 per cent. higher than in sample *B*, while the silver was 1.5 per cent. lower. The original table is worthy of study in detail. If we had enough records of this kind it might be possible to establish the source of errors beyond dispute. Ten of the lots had less than 10 oz. silver per ton. In five samples *A* was 2.45 per cent. higher than *B*; in the other five *A* was 3.68 per cent. lower than *B*. The eleventh lot was the only one that approached in value the ores usually sent to custom smelters. It contained 25.7 oz. in *A* and 26.4 oz. in *B*, a difference of 2.65 per oz. and 0.31 oz., a difference of 6 per cent. I cannot find anything in the design of this mill or in the use of machinery which affords any other explanation of the discrepancies than fractional retardation and separation of fragments that ought to have kept together during the seven crushings and samplings to which the ore was conveyed through strongly inclined chutes by gravity alone (the last rolls being fed by an apron). The assays show that there was some cause of variation in the mill and the only variable discernible is the effect of gravity feed. Certainly it was not in Mr. Johnson's samplers which are of the best type. It is not likely that such a variation as 3 per cent. could occur in sampling ore above ½ in. diameter, and I attribute the differences to delayed sampling of rich fines apart from the coarse ore that belonged with them. The successive crushings were to maximum sizes of 3, ¾ and ¼ in. or 5, 1¼ and ½ in. but always containing fines and the behavior of dust and fine ore in long spouts with a slope of 55 deg. would be very different from that of coarse ore.

Sampling as a System of General Averaging

As now conducted sampling is a system of general averaging in which the correctness of an individual act is not asserted, but accuracy is made to depend upon an incessant repetition of these individual acts in the hope that their plus and minus errors will balance. A sampler making 11 r.p.m. and two cuts per revolution takes 1330 cuts in 10 hours, and if the feed is 400 tons the weight passing through is 60.6 lb. for each cut. With 15 per cent. cut 9.9 lb. goes to the sample and 51.51 lb. to the reject. Sampling as conducted now may be said to disregard the question whether the 9 lb. is a fair sample of the 51 lb., but asserts that 9 lb. × 1330 is a fair average of 51 lb. × 1330.

I consider it evident that sampling would be improved if the first of these assertions also could be made true and each 9 lb. be a fair average of the 51 lb. with which it entered the mill. I believe that accuracy can be increased by controlling the retardation of the ore so that two important improvements can be made. Separation of particles that ought to be associated can be lessened materially and equal quantities of ore can be delivered to the samplers in equal times —one revolution of the sampler for instance. The essential point is that the ore shall be moved to each machine (except perhaps the first crusher) by mechanical means instead of by gravity. There must be conveyance either by belts or shaking spouts or aprons, as any of these is more durable than screw conveyers. The changes required for such a mill are not objectionable. With belts it might be necessary to make the building longer, but its hight would be decreased more than correspondingly. Shaking spouts would probably be best for samplers and shaking aprons to distribute the ore to rolls. As to power required for these additions and expense of maintenance it would not compare with the power used in elevating the 15 or 20 ft. which would be saved in hight and the cost of repairs would not be a tithe of those an elevator calls for.

The dispositions necessary to introduce shaking spouts are neither expensive or intricate. Separate shafts and belts would often be unnecessary for crushing machines of all sorts can be designed so that shaking arrangements can be attached. The movement required is very small, since the spouts can be given any slope

(less than the angle of rest) which is needed to pass the output of the machine while still keeping the spout properly loaded. The latter is an essential point, for this discussion is based upon the belief that good sampling is dependent upon keeping a body of ore in the spout so that there will be no intermissions in the delivery to the sampler. The slope must be adjustable so that the spout can be set to deliver a stream just large enough to dispose of the day's work. The most serious criticism to be made on the gravity system of feed is that regularity is impossible and in the mills I have seen it was only in the last cut, which was preceded by apron feed to the last rolls, that regular feed and a really fair sample were taken.

Suggested Improvements

I have never seen the subject of sampling discussed from the point of view I have taken and therefore I may be pardoned for repeating: (1) That particles of ore thrown together into the first (or any other except the last) crusher become separated (without the millman's cognizance) and subsequently are sampled apart from each other. (2) The results of this separation are not known, but I believe them to be adverse to good sampling. (3) I would correct this evil by introducing controlled feed in the place of the haphazard effects of gravitation which cannot produce regular action from the heterogeneous mixture of sizes and densities of ore as it is mined and crushed.

The effect of controlled retardation upon the general plan of a sampling mill may be understood by the changes which would follow the introduction of shaking spouts into the Great Cobar mill, which is a good example of the arrangement of a modern mill. Its elevations are not excessive and the effects of retardation are moderated, though not eliminated. The elevations needed would be:

Elevator headfall	6 ft.
Collecting bin	3 ft.
3 crushers	11 ft.
4 samplers	6 ft.
7 spouts	11 ft.
Foundations	7 ft.
	44 ft.

The lift of No. 1 elevator would therefore be 45 ft. instead of 61 ft., vertical, between centers. The allowance for the shaking spouts includes provision for slope adjustment.

Accurate sampling is one of the most important subjects before our profession. I think the statement so often made that the two samples by opposite cuts of one machine do not vary more than 0.5 per cent. and therefore the excellence of the work (usually the excellence of that machine's work) is proved has some basis in fact. Still it does not prove more than that there is a harmonious balance of the work and success achieved by much repetition. It disregards the fact that there is a multitude of unseen blunders and unknown errors going on all the time.

I have often been impressed by the fact that while gravity is the most common force in use its actual influence upon our milling has not been appreciated until recently. Its controlling effect upon crushing, and consequently screening, has been known for years, as pointed out for instance by Scobey (*Min. and Sci. Press*, June 1, 1901), but not always. If I remember aright Rittinger does not mention it, but he fed rolls from a shaking apron, or similar device, with a fall of 8 or 10 in. which gave a velocity that suited the slow moving rolls of his time. He knew nothing of sampling as it is done in our day and it is in this important work that the effects of gravity are erratic.

It may be thought that the improvement I suggest is rather belated for a novelty, since shaking aprons, with their controlled feed, have been used for a century at least and I have spoken above of two in sampling mills, but if there is a mill in which such devices are used to regulate the work at every step I have not seen nor heard of it. I believe the introduction of calculated control of feed would be a novelty and a valuable one.

Gems in New South Wales and Queensland

By F. S. Mance*

But little attention is now devoted to the mining of diamonds in New South Wales and the stones obtained are secured in the course of treating the stanniferous drifts. The stones are exceedingly small and, therefore, difficult to market. The yield recorded for 1907 is 2539 carats, valued at £2056.

The precious opal won in New South Wales during 1907 is valued at £79,000. The opal was chiefly obtained in the vicinity of White Cliffs. A new field is being opened up at Wallangulla in the Walgett division. A dark variety of opal, known as black opal is mined there and choice specimens bring as high as £40 an ounce in the rough. The deposits in the State of Queensland contributed an output valued at £3000 in 1907.

The sapphire deposits at Anokie in the State of Queensland were actively exploited and stones to the value of £40,000 are estimated to have been won during 1907.

The simplest way to treat waste sulphuric acid in a brass plant, states a writer on copper and brass, is to evaporate it to one-half its bulk, using waste heat from the furnace, which crystallizes out most of the copper sulphate.

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Electrolytic Determination of Bismuth

F. J. Metzger and H. T. Beans (*Journ.*, Am. Chem. Soc., April, 1908, p. 589) describe a method for the electrolytic determination of bismuth which is said to be free from the difficulties encountered in previous methods. The metal is deposited in compact form and can be washed and dried without loss, and there is no deposit of peroxide on the anode when the electrolysis is complete.

The principles of the method are: the use of acetic acid to prevent the hydrolysis of the bismuth nitrate solution, the elimination of free nitric acid by the addition of sodium hydroxide, and the addition of boric acid to improve the character of the deposit and complete the solution of bismuth hydroxide without the addition of large quantities of acetic acid.

The bismuth is dissolved as a nitrate in water containing 25 c.c. of concentrated nitric acid per liter. To a known volume of this solution phenolphthalein is added; then sodium hydroxide solution, drop by drop, to alkaline reaction. The precipitate formed is dissolved in acetic acid and then two grams of boric acid are introduced. The solution is diluted, heated to 70 to 80 deg. C. and electrolyzed. A rotating cathode is employed.

Mining in French Guiana

In a commercial review of the colony of French Guiana, consular clerk Milton B. Kirk, of Paris, states that on account of the rush of gold hunters, agriculture has been almost abandoned. Concessions of from 100 to 400 hectares (247 to 988 acres) are given for periods of from two to five years, and are renewable almost indefinitely. A decree of March, 1881, regulates the prospecting and exploitation of the goldfields, and may be obtained at the colonial offices in Paris. Permits are granted to anyone without regard to nationality. Gold, which was first discovered near the headwaters of the river Appronague, is today being exploited in the beds of all the principal rivers from the Oyapock to the Maroni.

Silver, copper, lead, iron and mercury are found at many points. Topaz, chalcedony, garnets, amethysts and jade have also been discovered. Expeditions are now being sent into the interior highlands to prospect for diamonds, which are said to exist.

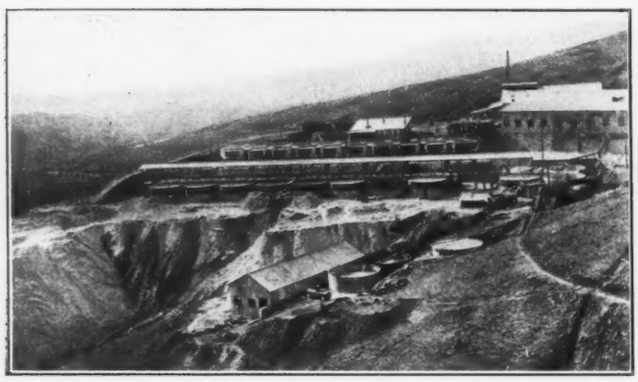
According to E. M. DeGarston, British vice-consul at Santo Domingo, alum is found at the confluence of the Jimenoa and the Yaque del Norte rivers, in the Dominican Republic. This is a superficial deposit, from which the inhabitants gather alum for disposal in the city of Santiago.

Notes from Mexico.

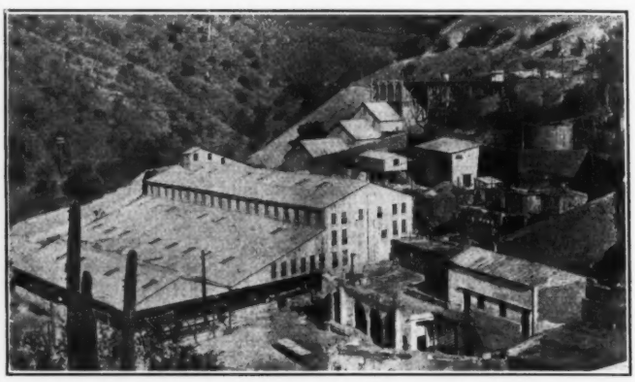
SPECIAL CORRESPONDENCE

The La Union mines near Parral, Chihuahua, are being unwatered, and the new manager, Capt. Charles Blunt, hopes to age will increase slightly the high extraction as well as save the small amount of cyanide now lost with the slime. The extraction reaches 60 per cent. by concentration with an additional 87 per cent. of the remainder by cyaniding, making a total of about 95 per cent.

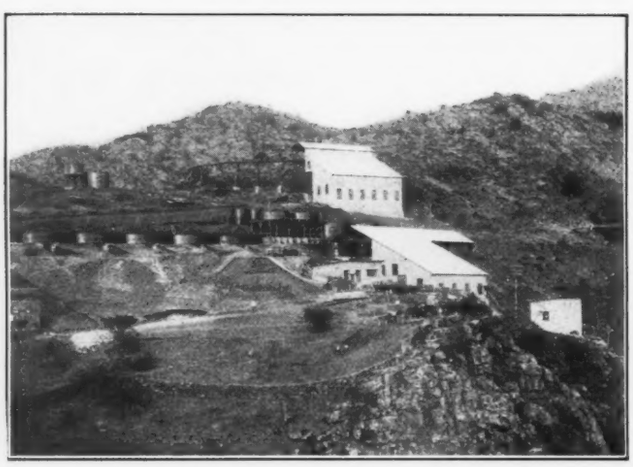
An increase in capacity of the Bustos mill of the Guanajuato Reduction and Mines Company is said to be contemplated. The mill now has 160 stamps with a full complement of vanners and Wilfleys. Two tube-mills regrind the sand for cyaniding. The additional plant will



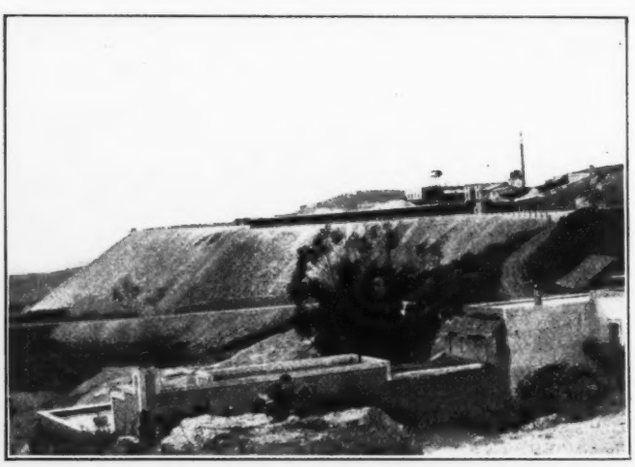
JESUS MARIA MILL, LA LUZ, GUANAJUATO



BUSTOS 160-STAMP MILL, GUANAJUATO

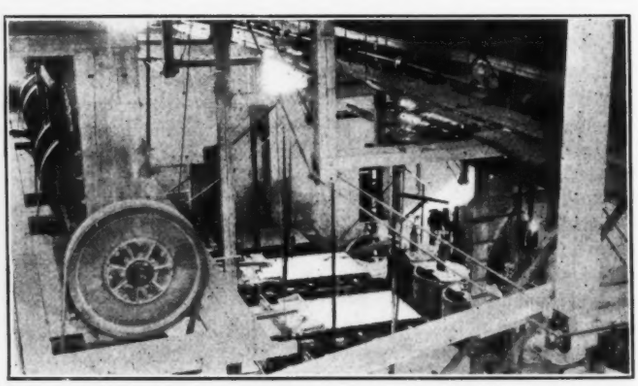


GUADALUPE MINE, NEAR INDE, DURANGO



EL BOTE MINE, ZACATECAS

EL CUBO MILL, NEAR GUANAJUATO



LA UNION MILL, VENCEDORA, CHIHUAHUA

begin converting the 30-stamp amalgamation mill into a modern fine grinding cyanide plant.

Experiments at the Pastitas plant of the Guanajuato Consolidated Mining and Milling Company have demonstrated that a slime filter or an increase in slime tank-

The Guadalupe mine, near Indé, Durango, has electric power supplied from a plant a few miles distant on the river. This plant is a stone's throw from that of the Indé Gold Mining Company recently constructed under the management of C. J. Stone.

consist of more regrinders and additions to the slime treatment plant, including an increase of filter capacity.

Lawrence P. Adams, general manager for the Guanajuato Amalgamated Mines Company, has almost completed an additional number of sand tanks in order to

increase the capacity of the cyanide plant. The ores of the mine have averaged, since the mill started, about $7 gold per metric ton.

El Cubo mill, near Guanajuato, is temporarily closed down while undergoing repairs and changes. The plant consists of stamps with sand and slime plant, slimes agitated with air and filtered on a Moore filter and concentrated on canvas tables.

Exhaustive experiments have been made recently at the mill of the Esperanza company, El Oro, under the direction of W. E. Hindry in a small plant, to determine the proper method of treating the large accumulation of sand tailings. The little plant contains two very small tube mills, a tank for mechanical agitation of the ground sand, two air agitation tanks of the Grothe type and a vacuum filter. On the results attained with this equipment it has been decided to place a number of tube mills and recyanide the sands.

The El Bote mine at Zacatecas under the management of J. S. Pattinson will change from amalgamation and lixiviation to the cyanide process, but without interfering with the operation of the present plant. Mr. Pattinson reduces 108 tons in 24 hours with six Chilean mills from ¾ in. to 85 per cent. through 150 mesh. He increased the tonnage per mill from 12 to 18 tons by changing the feed from 2 to ¾ inch.

Short Talks on Mining Law—IV

By A. H. Ricketts*

The United States Mining act, has incorporated in its provisions, the basic principles of the miners' rules, regulations and customs, that discovery and appropriation are the sources of title of a mining claim. That act provides, in terms, that "No location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located." While this requirement is confined by the statute to what is generally known as a "lode claim," it has been extended by the decisions so as to require a discovery of a valuable mineral deposit (not in place) within the limits of a placer mining claim.

It would seem, from the language of the act, that "discovery" should precede an appropriation, but under the decisions the order in which these acts are done may be immaterial. Nevertheless, until both these requirements are fulfilled, the claimant has merely an inchoate right and his claim may be defeated by adverse location, peaceably and openly made. In possibly all of what may be called the "mining States" (particularly excepting California), statutes exist permitting a given time after location or taking of certain steps perliminary to the perfecting of the same for the making of discovery, and prescribing the character and extent of the work that shall be done. This protects the claim from adverse mineral location during the time fixed by the statute or local rule governing in the particular place in which the claim may be situated.

Actual Discovery of Mineral

The tendency of the courts also is to shield the claimant while he is engaged, in good faith, in such quest. However, it is essential, in order to obtain title to the claim, that the location must be based upon an actual discovery of mineral within the exterior boundaries of the land sought to be appropriated. The requirements of the State or Territorial law, or miners' rules, regulations and customs (when not in conflict with the Federal mining law) must be followed in all events as necessary acts of location, but the mere sinking of a shaft the required depth or the running of a tunnel a certain length, under such local statute or rule, without actual discovery therein, or elsewhere, on the claim, on otherwise unappropriated territory, is not sufficient to validate the location.

The discovery, as such, need not be of commercial value, but the courts are not in accord as to whether it is sufficient if it be such as to *justify* a person in spending his time, labor and money in its development, or such as to cause him to be *willing* to make such expenditures; or whether it may be based on mere indications of mineral or not. The locator need not be the first discoverer of the deposit. It is sufficient that it be known to and adopted by him. In the absence of an intervening adverse location, subsequent discovery, says the weight of authority, will validate the location as against the Government and subsequent claims from the date of discovery, but not of location. Hence, intervening rights would not be affected by subsequent discovery in a location not based on a valid discovery in the first instance.

Whether the discovery is sufficient to validate the location is a question of fact and may be raised in a controversy between adverse mineral claimants, or by the Government in patent proceedings. A discovery may be sufficient in either of these instances which would be insufficient if the attacking party is an agricultural claimant. In the latter case the test would be the commercial value of the deposit and not that of its mere existence.

Marking the Location

The mining act provides that, "the location (not its boundaries) must be distinctly marked on the ground so that its boundaries may be readily traced." That is, that the location shall be so marked that its limits are clearly defined so that any person of reasonable intelligence can go upon the ground and by the marks thereon determine its lines. So flotation may be avoided and others be apprised of the ground appropriated. The cited law does not prescribe the character nor number nor position of the marks nor the time within which they shall be placed on the ground. Hence some courts hold that in the absence of a local statute or rule supplying such omissions that any physical marks whereby the boundaries of the location can be readily traced is sufficient and a reasonable time should be allowed for that purpose; while other courts hold that the marking should be immediate. Whether the location is sufficiently marked to comply with the paramount law is a question of fact and what is a reasonable time must be determined by the circumstances in each case. The courts are not in accord as to whether the marking of each corner and the end line centers with one or more notices of location is sufficient for the identification of the claim. However that may be, the fact still remains that marking corners of a location is no more than furnishing a means by which the boundaries can be traced and that can be done as well by posting a written notice of description at a point not upon the location at all. A location is not complete until the claim is so marked that its identification is certain. If the local statute or rule requires it to be marked in a certain way it must be so marked but that does not remove the possible doubt of non-compliance with the provisions of the mining act. The mere existence of boundary marks does not of itself prove that the location is either valid or subsisting. An adverse re-locator is not compelled to await a judicial determination of the question. He may make re-location peaceably in whole or in part and take his chances of subsequent litigation because of his action. Of course a valid location is not subject to re-location until the owner has forfeited or abandoned it. The boundaries of a location being once established control as to the rights to the surface and to the vein or lode upon its strike and the extra lateral right attached thereto. An effacement of the monuments is not fatal to the right to the location if not the act nor due to the fault of the claimant. If the question arises their former existence must be proved or at any time before that they may be replaced. If they exist at the time of adverse re-location they may be adopted by the re-locator or be may build or place new ones in their stead. A re-location is not always adverse as it may be the act of the owner. For instance to correct error in the original location, so to change its relative position to the strike of the vein or lode or to increase the extent of the claim if without prejudice to the rights of others. Such acts are usually termed an "amended" or "additional" location. If the location is excessive in size it is not necessarily void except as to the excess unless the location was fraudulently made. If not, the claimant has the

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right to determine the particular excess by segregation without re-location or amended location.

The courts are not in accord as to whether it is necessary to mark the boundaries of a placer location when taken up in conformity with the rectangular subdivisions of the public land surveys. Some of the courts hold that the governmental marking of the particular land appropriated is a sufficient means of identification, while others take the contrary view. This subject is sometimes regulated by local statute. If the location is of an irregular shape the marking of the boundaries is compulsory under the mining act. However, it is not necessary to separately mark the boundaries of each 20-acre tract contained in a placer location made by an association of persons.

The Identification of the Claim

A natural object may be a bay, butte, creek, cañon, gulch, hill, lake, mountain, mountain peak, river, stump of tree, stream, the confluence of streams, an arm of the sea, tree, water fall or cascade; a permanent monument may be an adjoining or nearby claim whether patented or not or owned by the locator or not, a blazed tree, city or town, cut or other excavation as a drift, shaft or prospect hole, a government monument, a post or stake firmly planted in the ground, a road or the point of intersection of roads, a pile of rocks, a railroad depot.

The mining act declares that, "all records shall contain such a description of the claim or claims located by reference to some natural object or permanent monument as will identify the claim." But no record need be made unless required by local statute or rule, but such addition to the act is not obligatory as a location is complete under the paramount law without the record but is defective if not made when required by such supplemental law or rule. Unless supported by local law or rule the record is not evidence. If a local rule makes a record necessary and the rule ceases to be in force and effect it may be disregarded. The object of the record is to secure a permanent definite description of the claim and prevent its swinging at the caprice of the claimant or to accommodate possible new conditions as well as to serve as a guide for others seeking to make locations in its vicinity. The course and distance from the natural object or permanent monument to some certain point of the location should be stated with reasonable accuracy, that is to state approximately the distance and direction from the starting point to some point on the claim, not necessarily, of course, with the exactness of a survey. The test is: does the reference fix the location with such certainty that by the aid of the record a person of ordinary intelligence can find the natural object or permanent monument and determine the boundaries of the location? The question whether the reference is sufficient is one of fact. The record is invalid if it is shown that the natural object or permanent monument does not exist as stated. The location is void if the record is silent upon the matter. The natural object or permanent monument may be on or off the location. The presumption will be indulged that if there was a natural object or permanent monument that would better identify the claim than that which is named it would have been referred to as the initial point. The record is usually liberally construed by the courts as they take into consideration that locators are not surveyors nor adepts in the law of conveyancing. What is denominated as the "record" in the mining act is usually called the "notice of location" or "certificate of location" and sometimes the "declaratory statement." In some jurisdictions it must be verified. The additional burden thus cast upon the locator is excused as being a safeguard from fraud. The "record" must always further contain the name of the locator, the name of the lode or placer claim, the date of location and such other recitals as local law or rule may require.

When the Location is Complete

The necessity for posting a notice of location upon the claim or making a record is dependent upon the local law or rule. Whether one act precedes the other is immaterial unless their order is expressly provided by the local law or rule. Even if not so required such acts add to the safety of the claimant although they are held to be devoid of legal effect in the absence of such requirement. So the recording of an instrument not authorized by law to be recorded does not impart construction notice, but the fact that a notice is posted or recorded generally by the miners in a certain locality is at least some evidence of a custom requiring such acts. It may be stated, in passing, that in these articles, for the sake of brevity, the word "rule" is used as equivalent to the term "miner's rules, regulations and customs."

The safe location of a mining claim demands an observance of the provisions of the mining act and of the local law and rules of which one cannot be assured except by a study of the same as a location is not complete until all the requirements of the same are compiled with. A patent is conclusive proof of a perfected location. The mining statutes of the various States and Territories are substantially similar but often differ in extent and detail. They provide, among other things, for a preliminary notice of location to be posted on the claim, give time for exploring and development work before the making of the record and provide what shall be stated in each, or that they may be identical as to contents. This intermediate period permits the locator to make sufficient excavations and development to ascertain whether the value of the deposit will warrant further proceedings; and, as in the case of lode locations the vein or lode is the principal thing, and as the locator secures only so much of the same as the location actually covers on its strike, the location should naturally be laid along its course whatever the character of the surface, whether level or inclined, such intervening time gives opportunity to better ascertain its strike before finally fixing the surface boundaries of the claim. The most practicable rule is to regard the course of the vein or lode as that which is indicated by outcrop or surface exploration or work. As has been said by one of the most eminent judges called upon to decide mining cases, "the mere posting of a notice on a ridge of rocks cropping out of the earth or on other ground that the poster had located thereon a mining claim without any knowledge on his part of the existence of metal there or in its vicinity would be justly treated as a mere speculative proceeding and would not itself initiate any right. There must be something more than a mere guess on the part of the miner to authorize him to make a location which will exclude others from the ground, such as the discovery of the presence of the precious metals in it or in such proximity to it as to justify a reasonable belief in their existence. Then protection will be afforded to the locator to make the necessary excavations and prepare the proper certificate for record. It would be difficult to distinguish a speculative location from one made in good faith with a purpose to make excavations and ascertain the character of the lode or vein so as to determine whether it will justify the expenditure required to extract the metal; but a jury from the vicinity will seldom err in their conclusions on the subject."

Record of Failure to Contribute

A provision is usually found in a local law for the establishing of record evidence of the "advertising out" of a co-owner who has failed to contribute his proportionate share of the annual assessment work. This is not even referred to in the mining act and there can be no valid record of the proceedings unless made the subject of local legislation. It may be an important link in the chain of title as the proceedings may or may not divest the title of the delinquent co-owner because of the insufficiency of the notice or because given by one not authorized by law to do so.

The Right of Possession

Prior to the passage of the first mining act (1866) mining on the public domain was a technical trespass and the right of the mineral claimant rested solely upon the right of possession and the forebearance of the Federal Government. This condition led to the passage of an act

by Congress previous to that statute to the effect that, "no possessory action between persons in any court of the United States for the recovery of any mining title, or for damages to any such title shall be affected by the fact that the paramount title to the land in which such mines lie is in the United States; but each case shall be adjudged by the law of possession."

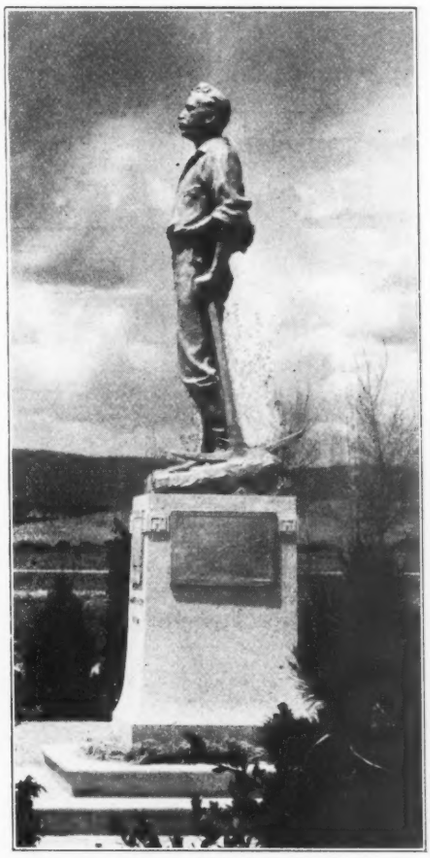
It has been held that the term "mining title" means the title obtained by compliance with the local rules and that the term "the law of possession" means the possession under local rules. Under the present mining act (1872) possession follows location with the paramount title remaining in the United States until patent issues. The possession may be actual or constructive; the latter alone is sufficient as a strict compliance with the act and local law or rule preserves the right. Discovery alone vests no right nor title in the location as it is but one step in acquiring title and must be followed by a performance of all other acts essential to location. Nor does possession follow location. Location unlawfully made initiates no right of possession. Without location the claimant's rights upon the public lands are confined to the place in which he is in the actual possession. Possession without adverse claim for the period prescribed by the local statute of limitations, say five years, for example, is equivalent to a valid location. So there may be a right of possession by virtue of a valid location or by virtue of the local statute of limitations. But there must be more than a loose, uncertain, scrambling and mixed possession of the claim to ripen into a right under such law. Mere possession will not avail against a valid location but possession alone is adequate as against a mere intruder or trespasser even without color of title, especially so as against one who takes possession by force and violence. A mere intruder and trespasser cannot make his wrongdoing successful by asserting a flaw in the title of the one against whom the wrong has been by him committed.

The right of possession may be transferred by deed before the location is completed. In an action growing out of an application for patent each party must not only prove his right of possession against his adversary, but also against the United States and the judgment may be in favor of neither on that point. An agricultural patent carries the title to all minerals found within the area described therein subsequent to its issuance and the possession of the holder cannot be disturbed by prospectors without his consent. If the land was in fact mineral at the time the patent was issued it is not subject to attack upon that ground except by the Government, unless it contained a "known mine." The term "agricultural" in the sense here used is not confined to land subject to cultivation.

John W. Mackay

The accompanying illustration shows the statue of John W. Mackay, which stands in front of the new mining building of the University of Nevada, a gift of his son, Clarence H. Mackay. It represents him, pick in hand, in the characteristic garb of the miner.

This is precisely as it should be, and the sculptor, Gutzon Borglum, has made the most of his rare opportunity. How unfortimate it would have been if John W. Mackay had been represented wearing a high hat and a frock coat! As a miner he laid the foundation of his fortune, and as a miner he will be remembered.



So many families of wealth try to conceal the humble employment of the founders of their fortunes, that it is a genuine surprise when the truth is actually gloried in.

Clarence H. Mackay will be esteemed all the more for his pride in the early deeds of his father; Mr. Borglum will win praise for his artistic perception and execution; and the University of Nevada will be congratulated upon having so noteworthy a monument.

The osmium filament takes 1.5 watts and the tantalum 1.7 watts for direct current, and somewhat more for alternating.

Quicksilver in Russia During 1907

By I. I. Rogovin*

Cinnabar, the source of mercury in Russia, is extracted only by one single concern, Auerbach & Co., whose work is in the Province of Ekaterinoslav, Bachmut district. The industry is in a state of decay, partly owing to exhaustion of mines and partly because of financial reasons. Therefore the production of mercury has considerably decreased lately. The production in 1904 was 20,256.3 poods; in 1905, 19,401 poods; in 1906, 12,848.7 poods, and in 1907, 8,055.4 poods.

On the other hand the consumption of mercury has not decreased in Russia and owing to the increased price in the world's market, the expenditure for the metal rose considerably. In St. Petersburg the price rose recently from 78 and 81 rubles per bottle of 76.5 lb., to 82 and 92 rubles.

Rumors have recently been afloat that the Auerbach & Co. enterprise would be purchased by a group of English capitalists, who intend to make new explorations to increase the output of cinnabar. Although English engineers have examined the property, the decision is still pending.

Cinnabar is found in Russia in a few other places, in the Ural, and in the Altay district, West Siberia, but these deposits appear to be of no present industrial importance.

By-profits of Gold Dredging

Special Correspondence

At Oroville, California, where such extensive dredging has been done, other profits than the gold won have resulted. The new rock-crushing plant of the Valley Construction Company has started up its first crusher on cobbles from the dredge-mining operations there, and three other crushers are to be installed. The crushed stone finds a ready market for road making and for concrete. The man who owns the land from which these dredge cobbles are being taken received $3000 an acre for the mining rights on 17 acres from the Nevada Gold Dredging Company, and will receive several thousand dollars from the rock-crushing company for the cobbles. After the cobbles are crushed and removed he expects to sell building lots in an addition to Oroville. This shows that dredge mining is often profitable to those not actually employed in operating the dredges.

The first commercial metallic-filament lamp was the osmium lamp, invented by Auer von Welsbach in 1898. It became of commercial importance in 1902.

Veta Colorado Cyanide Mill, Parral, Mexico

This Pioneer Cyanide Mill for Treating Silicious Silver Ores from the Veta Colorado Vein Will Use Fine Grinding, Agitation and Filtration

BY CLAUDE T. RICE

In the past the bulk of the ore from this long vein near Parral has been smelted, but some of the poorer ore has been roasted and lixiviated with hyposulphite. In fact the Refugio and Preseña mines are equipped with lixiviation mills, the Preseña with two and the Refugio with one, all of 80 tons capacity per day; at present these are shut down.

Lixiviation is expensive, since it necessitates the roasting of sulphide ores, and the percentage of extraction on ores of low grade is small. Therefore it has become necessary to devise some cheaper and more efficient mode of treatment. The Veta Colorado Mining and Smelter Company, which owns the Quebradillas and Santiago mines decided originally to follow the example of Guanajuato and treat these silver ores by cyanidation.

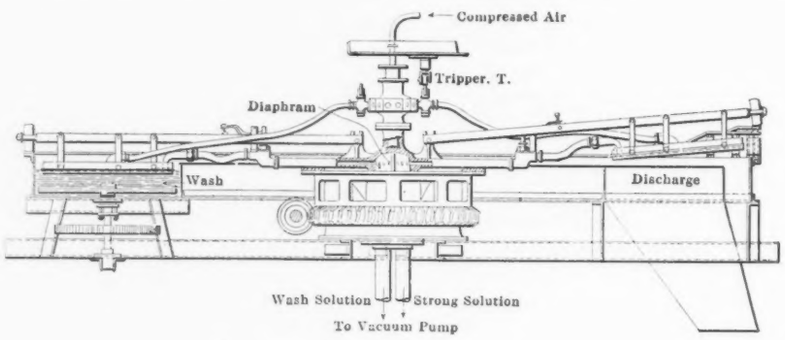
The Veta Colorado ores are highly silicious and strictly silver ores, for they contain little gold and that mainly in the pyrite. The silver occurs both as argentite and as silver chloride; the lead, zinc and copper content is very variable but never is greater than 1 per cent. lead, 1 per cent. zinc and only a trace of copper. The silica content is about 60 per cent. while the iron pyrites in the ore amounts to 2 or 3 per cent.

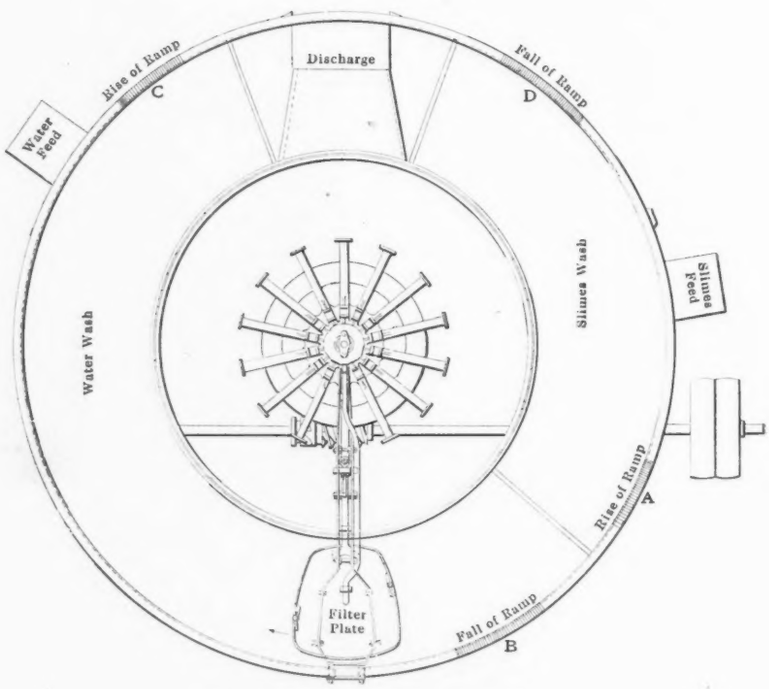
Treatment by Cyanidation

At first the company intended to treat the silver ore by decantation and to follow the general mode of treatment used at Guanajuato. In fact the mill site had been graded for such an installation and the tanks had been ordered, when it was decided, after consulting with Robert Allen of Kalgoorlie, Australia, to use fine grinding and agitation.

The plans were therefore revised, and the mill treatment was made to conform more nearly with the Australian method of treatment in this, the pioneer plant in the Parral district. This mill is not completed, but is almost finished and the machinery can be installed in three months. The treatment therefore can only be outlined at present. Later it is hoped that a detailed description of the ore treatment will be given.

The ore is crushed in a separate breaker house in Blake crushers, the crushers being arranged in duplicate, and crushing in series as is indicated in the accompanying flow-sheet. The ore is then conveyed by a Robins belt conveyer to the bins above the stamps. On the way the ore is sampled and automatically weighed by a Blake-Denison weigher. The ore bin is divided into eight compartments, and the belt conveyer is provided with a movable tripper so that the ore in the different compartments can be kept uniform in composition. These bins have flat bottoms, and the sill timbers for the bin form part of the battery frame, so that the ore in the bottom of the bin not only is a reserve, but it helps by its weight to steady the battery frame.





SLIME FILTER, VETA COLORADO MILL

Details of Stamp Batteries

The ore from the bins is fed by Challenge feeders to the stamps which weigh 1050 lb. and which drop in El Oro mortar boxes, weighing 9500 lb. Each group of 20 stamps is run by an individual motor from a line shaft placed near the floor. The mortar rests on a concrete mortar-block, and the cam-shaft floor is built separate from the battery frame, so that it will not vibrate.

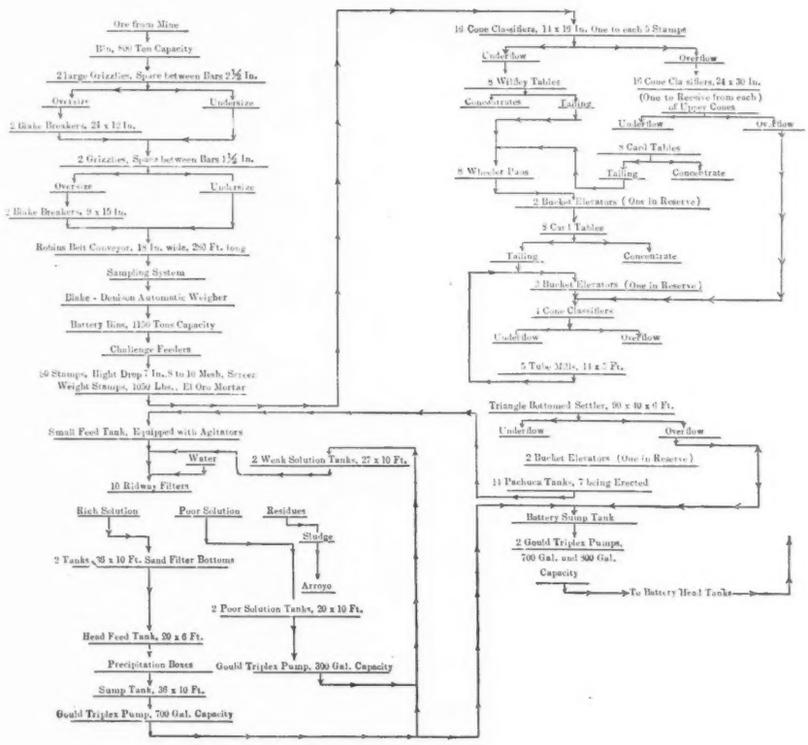
The hight of drop will be about 7 in. and as 8- or 10-mesh screens will be used and the hight of discharge will be kept as low as possible, it is expected that the tonnage crushed per stamp per 24 hours will be about 6½ tons.

The ore is crushed in weak cyanide solution, and the pulp from each 10 stamps is separated by two cone classi-

fiers into coarse sand, fine sand, and slime. The coarse sand from each set of cones goes to a Wilfley table, the fine to a Card table, while the overflowing slime goes to four cone classifiers which separate the finest of the pulp for further grinding in the tube mills.

The tailings from the tables treating the coarse and fine sands go to eight Wheeler pans where they are reground and then elevated to eight Card tables.

The Wheeler pans are a modified form of the Australian type, in which the muller is suspended by gimbals from a yoke (sliding vertically on a feather on the vertical driving shaft) so that the muller can adjust itself to the ore. These pans are 5 ft. in diameter and 3 ft. deep; the discharge hole, 3 in. diameter, is


Ore from Mine
Bin, 800 Ton Capacity
2 Large Grizzlies, Space between Bars 2½ In.
Oversize
Undersize
2 Blake Breakers, 24 x 12 In.
2 Grizzlies, Space between Bars 1½ In.
Oversize
Undersize
2 Blake Breakers, 9 x 15 In.
Robins Belt Conveyor, 18 In. wide, 280 Ft. long
Sampling System
Blake-Denison Automatic Weigher
Battery Bins, 1150 Tons Capacity
Challenge Feeders
50 Stamps, Eight Drop, 7 In., 8 to 10 Mesh, Screen
Weight Stamps, 1050 Lbs., El Oro Mortar
Small Feed Tank, Equipped with Agitators
Water
2 Weak Solution Tanks, 27 x 10 Ft.
10 Ridway Filters
Rich Solution
Poor Solution
Residues
Sludge
2 Tanks, 38 x 10 Ft. Sand Filter Bottoms
Arroyo
2 Poor Solution Tanks, 29 x 10 Ft.
Head Feed Tank, 29 x 6 Ft.
Precipitation Boxes
Gould Triplex Pump, 300 Gal. Capacity
Sump Tank, 36 x 10 Ft.
Gould Triplex Pump, 700 Gal. Capacity
16 Cone Classifiers, 11 x 15 In., One to each 5 Stamps
Underflow
Overflow
5 Wilfley Tables
Concentrates
Tailing
16 Cone Classifiers, 24 x 30 In.
(One to Receive from each of Upper Cones
Underflow
Overflow
8 Card Tables
8 Wheeler Pans
Tailing
Concentrate
2 Bucket Elevators (One in Reserve)
8 Card Tables
Tailing
Concentrate
2 Bucket Elevators (One in Reserve)
4 Cone Classifiers
Underflow
Overflow
5 Tube Mills, 14 x 5 Ft.
Triangle Bottomed Settler, 90 x 40 x 6 Ft.
Underflow
Overflow
2 Bucket Elevators (One in Reserve)
14 Pachuca Tanks, 7 being Erected
Battery Sump Tank
2 Gould Triplex Pumps, 700 Gal. and 800 Gal. Capacity
To Battery Head Tanks

FLOW SHEET, VETA COLORADO MILL

about one-half way up the side. It is thought that each pan will have a capacity of 25 tons per 24 hours.

The tailing launders from the tables are made in the solid concrete and are given a 6-per cent. grade so that there will be no danger of clogging.

The eight Wheeler pans are driven from the line shaft that runs the belt elevators, which raises the pulp to the Card tables and the tube mills, and one of the battery pumps. This line shaft is run by two motors, another motor being held in reserve.

The tailing from the secondary tables and the overflow from the four large classifiers are sent to five tube mills, 14 ft. long by 5 ft. diameter. These tube mills are mounted on hollow trunnions and are fed through these trunnions by large scoop feeders. Chilled-steel liners, 1⅞-in. thick, will be used in the tube mills.

Settling the Pulp From the Tube Mills

The pulp from the tube mills is elevated then to the cones above the tube mills and is again classified. The overflow from the classifiers above the tube mills is then taken to a large settler 90 ft. long by 40 ft. wide and 6 ft. high (measured from top of tank to bottom of V-trough). The bottom of this tank consists of a series of eight V-troughs, 5 ft. wide and having an angle of 60 deg. at their apices. In the apices of these troughs are placed the discharge valves of the adjustable clamp type. The water in this settler is kept about 8 in. higher than the tops of the V-troughs, the sides being extended higher so as to protect the surface of the large tank from wind. An even distribution of the pulp is obtained along this long tank by splitting the feed into six parts, each part going to an iron trough having a perforated bottom, and divided by partitions into compartments 15 ft. long. Tanks similar to these, except that a series of pyramids forms the bottom instead of a series of troughs, are used at Broken Hill where they work well.

In this settler most of the pulp will be drawn off from the first two troughs and a clear overflow will be obtained which goes to a battery solution tank 36x10 ft., whence it is pumped by two Gould triplex pumps, one 700-gal. motor-driven and one 800-gal. belt-driven, to the solution tank above the batteries.

The underflow from the large settler is mixed with strong cyanide solution and then elevated to the 12 to 14 Pachuca tanks, in which it will be agitated for two days. Only seven of these tanks are being erected at present; they are 45½ ft. high and 15 ft. diameter.

The pulp at the end of that period is then taken to 10 Ridgway filters where the pulp is filtered.

Filtering by Ridgway Filters

Ridgway filters are being introduced at different mills in Mexico, and as they are rather new to American readers their mode of operation will be indicated.

The Ridgway filter consists of a series of 13 leaves, having a filtering area of about 4 sq. ft. each, suspended from a rotating framework, driven by a hollow central shaft, and supported on the circumference by wheels traveling on a track which forms the top of the outer side of the annular trough (outside diameter 13 ft. 2 in., inside diameter 8 ft.) over which the leaves pass.

The leaves of plates consist of a thin wooden box over the perforated underside of which is stretched canvas cloth; the top is connected by two lines of hose, one to the suction chamber and the other to the compressed-air chamber.

The trough is divided radially into three sections, in one part of which is the pulp, in another part the wash water and under another part is the hopper into which the washed cakes of residue drop when discharged from the filter. The parts of the trough containing the pulp and the wash solution have agitators in the bottom which keep the slime in the first and any overcarried slime in the second section from settling.

At the beginning of the cycle the leaf is immersed in the pulp, and with fairly silicious (sandy) pulp a cake, ⅜ in. thick is formed in 13 sec. during which time the plate is in the first compartment containing the pulp. As the leaf approaches the end of this compartment the rim or track (at *A*) gradually rises and therefore as the frame revolves the roller passing up this incline raises the filter plate out of the pulp. The strong solution is thus sucked from the filter for a brief part of the revolution; then the track (at *B*) again descends and the leaf passes into the wash solution which is in the second compartment. At *C*, the filter is again raised out of the solution and the filter sucked "dry" (the filter cake contains about 30 per cent. moisture) until when the section, under which the discharge hopper is placed, is reached, the connection with the vacuum cylinder is closed and connection with the

compressed-air chamber is made by tripper *T*. This puff of air drives the cake off the filter and the cycle begins again upon the plate reaching the incline *D* where the leaf enters the pulp solution. As the 12 other plates are following the same cycle and as the rate of revolution is generally one per minute, 13 cakes are discharged each minute. The length of each portion of the cycle, when one revolution is made per minute, is 13 sec. in the pulp, 7 sec. passing from pulp to wash-water compartment, 30 sec. in the wash water, 7 sec. lifting and drying and 3 sec. discharging.

As has been said there is a chamber in the shaft, connected with a vacuum pump, so that the filtered solutions are drawn into it. In this chamber an adjustable but non-rotating diaphragm is placed. This diaphragm is one of the important features of this filter for this partition is so adjusted by experiment that the wash water is cut out at the point where it is too poor to pay to send the solutions to the zinc boxes to be precipitated.

Precipitation of the Solutions in Zinc Boxes

The weak solution goes to the two poor-solution sump tanks whence it is returned by a 300-gal. Gould triplex pump to the two head-solution tanks. The rich solution is taken to two sand-filter tanks whence the solution flows to a head-feed tank which feeds six zinc boxes where the silver is precipitated. The tail solution then flows to a sump tank whence it is pumped by a 700-gal. Gould pump to the two head-solution tanks or to the battery-sump tanks in case the head-solution tanks are full. The residues from the Ridgway filter are pumped with water and sent by launder to the *arroyo*.

In the clean-up a Dehne filter press, having 30 plates, 30 in. square, is used. This is fed by a Dehne power pump.

As will be noticed, in this mill there are two circulations, one, the weak solution, in which the ore is crushed and the other, the strong solution, in which the ore is agitated. The weak solution is not taken to the zinc boxes for it is too poor to precipitate, but since considerable solution escapes from the upper circulation in the pulp going to the Pachuca tanks, the solution gradually works downward into the rich solution and is precipitated.

It is calculated that about 1½ tons of water will be used per ton of dry ore treated. The water used will come from the mine, for this mine water is fairly free from acids or detrimental impurities. At present no provision is made for cyaniding the concentrates, but later it is planned also to treat the concentrates by fine grinding, agitation and filtration.

The mill will be run by Westinghouse induction motors which are driven by a 3-phase 25-cycle, 400-volt current generated by one 200-kw. and three 380-kw. Westinghouse dynamos. The dynamos will be driven by four 200-h.p. Corliss horizontal-compound engines. A 10-drill Norwalk straight-line, compound-air, compound-steam compressor will furnish compressed air to the mine and to the agitation tanks. These engines are equipped with a barometric condenser, and the steam is generated by a battery of eight Heine boilers, two 100 h.p., two 150 and four 250 h.p. in capacity.

This mill will have a capacity when fully equipped, of treating 500 tons of ore per day, and will be used to treat custom ores as well as ore from the mines of the Veta Colorado company. By changing from fine battery crushing followed by cyanide leaching of the sands and mechanical agitation followed by decantation of the slimes, to total "sliming" of the ore followed by air agitation and mechanical filtering of the "slime" the treatment period will be reduced from about 18 days to two days, and more than double the tonnage will be treated with only little more than one-half the tank capacity. As the mill is built on a side hill very little elevating is necessary, but owing to the fact that the mill was not originally designed for sands and slimes treatment, the terraces made were much too large for the present "sliming" plant so that it covers more ground area than it would have otherwise.

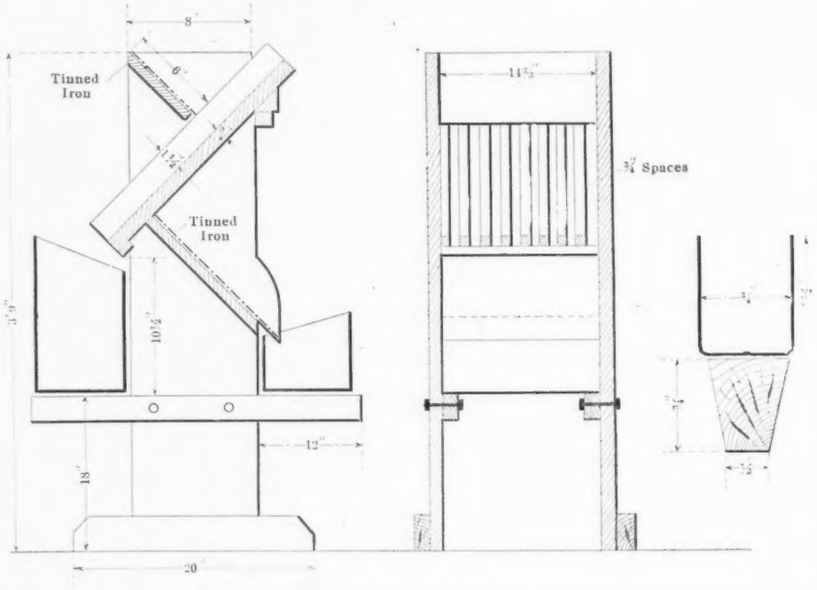
The mill as finally built has been designed and is being built under the direction of Robert Allen, of Kalgoorlie, West Australia, who is consulting metallurgist to the Veta Colorado Mining and Smelter Company.

As yet the mill is far from completion, but its operation will be eagerly watched by metallurgists, not only because it will be the pioneer cyanide mill to treat ore from the Veta Colorado vein, but also because it introduces to America so many principles of Australian cyanide practice.

A New Sampling Device

By A. Livingston Oke*

At La Gloria mine, Batopilas, Mexico, recently, the necessity was felt of some means of rapidly cutting down both mine and mill samples, in order to eliminate the laborious and (probably) incorrect quartering down on canvas sheets. The accompanying drawing is a sketch of a simple sampler I designed for the purpose; a Mexican carpenter built it in a few hours from wood and a couple of coal-oil cans. The drawing may be useful to some of your readers similarly situated. In connection with it I may point out that the portion of the sample taken for use falls through the spaces between the riffles, and therefore runs no risk of salting from a previous sample other than from imperfect cleaning of the two inclined surfaces. These are, however, covered with tinned-iron, as shown, to minimize this.



SAMPLING DEVICE AT LA GLORIA, MEXICO

This sampler permits the use of variously spaced grills to suit the size of sample being quartered down, and to this extent it seems to be an improvement on existing types, which are made in various sizes with the same object in view.

The detail to the right shows an enlarged section of the riffle-bar, which is made from tinned sheet iron doubled and supported underneath by a tapered strip of wood.

*Assistant manager, Mina la Gloria, Batopilas, Mexico.

The Yaqui War

SPECIAL CORRESPONDENCE

The truce between the Mexican Government and the rebellious Yaqui Indians, in evidence from early in May to a few days ago, was broken by the Indians and hostilities are now raging more fiercely than before. A great deal has been written by parties more or less informed concerning the difficulties, but a plain statement of a war that has laid waste a district 100 by 200 miles, has resulted in the death of hundreds of Mexicans and some score or more of Americans, many of them prominent engineers of international reputation, and has proved too serious a matter for the government of the State of Sonora, may be interesting.

The Yaquis are a small tribe; when I was last among them there was not believed to be more than 500 fighting men among the hostiles. They have been waging a desultory warfare against the State authorities for many years. This was brought about by the determination of the Mexican government that their tribal lands, their patriarchal inheritances, should revert to the state, and they should be compelled to abandon their homes in central Sonora and live as best they might, among the Spanish inhabitants. For a long period their necessities did not compel them to commit any depredations against the few Americans traveling that region. These were prospectors, developers of mines and engineers sent there to report on what is conceded to be one of the richest mineral sections of northern Mexico. They looked with jealousy on this influx of "Gringoes," but did not dare to call down the vengeance of the troops, which they knew would have to follow if they shot foreigners. So long as they killed only Mexicans, mostly peons, the local authorities were somewhat indolent; the killing of Americans would, they thought, arouse the attention of the United States and force the Government to take them to more strict account. But they coveted the outfits of these Americans; their arms, ammunition and supplies were always more complete and elaborate than those of wandering Mexicans, or of the lone ranchers in the Yaqui valleys. Finally, about four years ago, a party of Americans headed by a well known engineer from Chicago, named Mackenzie, was ambushed and several of the men shot, including Mr. Mackenzie himself. No excess of vigilance, no demands from the American Government following this, the Yaquis became less careful, and since then sporadic cases of shooting Americans have followed. Americans going through the Yaqui districts were compelled to travel by night in the most careful manner, to cover their trails, to maintain watch, and were never permitted to make these trips without a warning by the Mexican authorities and a proffer, by them, of a guard of troops. This, of course, to diminish Mexican responsibility and to make the traveler himself liable in law for what might happen to him.

To this was added the absolute prohibition upon the importation of guns, revolvers or ammunition into western Mexico. Permits to carry these things across the line were obtainable only from the secretary of war, upon the recommendation of General Torres, whose headquarters were at Torin, southern Sonora; the discovery of an attempt to smuggle in arms would subject one to severe punishment and the confiscation of the articles. As it was unsafe to travel without arms, the number of Americans going in was cut down to a mere straggling few, who might either go in with permits or succeed in secreting what they needed. On one trip across the line, due for a long journey near the infested region, I smuggled over an armament of three rifles, three revolvers and 700 pounds of ammunition, although the custom house search was very rigid at the time. The reason given by the government for this prohibition was that the Yaquis were in need of such supplies, and would surely kill any Americans who might take them in. As a matter of fact, if Americans had been permitted to cross freely with ample armament, the Yaqui question would long ago have been settled, for Americans are good shots and not afraid to fight. Quite recently the Mexican government seems to have realized this latter fact, and the prohibition has been raised.

Some years ago the Yaqui leaders were invited to peace conferences, such as have recently been under way. They arrived at the scene of conference and were told to leave their arms behind when meeting the representatives of the state. This was done, and when they arrived they were met by an ambush and shot down in cold blood. It is the continuance of such acts that has made peace so difficult. The Yaquis may be treacherous, doubtless are, but they are probably no more so than their opponents. At one time it is stated the troops in one of their numberless raids against defenseless families threw the little Indian children on cactus spikes and set the plants afire. This story, with a good deal of elaboration, was told me by a prominent official who claimed to know. I have seen scores, yes hundreds, of "tame" Yaquis, that is, men of the tribe who had been living in some town, working quietly at their trades, rounded up by the soldiers, placed in the jails and kept there until there were enough for a shipload, then forwarded to Yucatan to work in the hemp plantations. I have seen the streets of Guaymas crowded for a block around the jail by the wives and children of these men looking their last on their male relatives, whose only crime was the Indian blood in their veins and that they were suspected, whether with or without reason made no difference, of furnishing assistance to their brethern in the field. I have seen, in the great state prison at Hermosillo, a prison of stone and concrete built by Yaqui labor, hundreds of women and children herded in open pens sunk in the ground, separated from their relatives, to be sent to Yucatan, as our own slaves were sometimes sent to work in the rice and cane fields of the far South. I have ridden through the trails of interior Sonora and frequently come to the swaying bodies of hanging Yaquis, who may have been suspended there for days, or for months. These gruesome reminders of war and retaliation are not uncommon in the district east and south of Hermosillo and around Ures. The crime for which these men were hung was the mere carying of firearms, which they may have needed for protection or for obtaining food. Everybody in that section carries guns. I have seen half a dozen Yaqui men stood up against a back wall of some city prison, or near some city gate and shot, after they had dug the graves into which they themselves were to fall. These things were so common and so much a matter of course through parts of Sonora that the curio stores of several cities up to a short time ago displayed photographs of the incidents I have mentioned! How such a condition of warfare hardens the heart and puts a callous on all feelings of humanity!

It is the universal testimony of employers of labor in northern Mexico, on the west side, that these Indians are the best workmen available; they will do more, are more intelligent and willing, and are more brawny and muscular than their peon compatriots. Many of them have drifted across the line and they are to be found in considerable numbers on mining locations and about the towns of southern Arizona. That they earn money merely to send it back to their fighting brethren, as is claimed by the Mexican officials, may be true; it does not detract from their value as workers. A recent proposition of the government that all Yaquis in the country, wild or tame, men and women alike, in town or camp, be rounded up and deported, raised consternation at once and the cry was, "where shall we get laborers capable of good work." A "tame" Yaqui is one who, at the moment, is not on the fighting line. It is generally supposed that he may be there next week to be replaced by some man who comes from the front. It does not tend toward peace of mind on the part of the American employer to feel that the man who comes in and asks for a job to take the place made vacant by the desertion after pay day of some other Indian who has gone no one knows where, may have on his hands the blood of some Mexican family or some American prospector.

It is hard to speak plainly of the causes of the apathy of the state authorities, but

it may be said that graft, such as has been the bane of politics in the northern republic, has been at least one of the causes for the long delay in bringing this Yaqui matter to a focus. Many of the higher officials of Sonora are doubtless honest in their desire that the war shall cease and peace come to the state; but enough see in the continuation of the present disgraceful scenes the opportunity for theft and robbery which will make it very hard to end the struggle. It is not impossible, if the truth were known, that the breaking off of peace negotiations a week or two ago was due to some influences from this element. These negotiations were brought about by the demands of the government of the Republic that the state should get busy and do something. The war has been resumed and 4500 soldiers are in the field under command of Gen. Lorenzo Torres, of Torin, which is on the border of the Yaqui country; indeed, Yaqui outrages have been committed within sight of the fortress there. They have been committed on the orange groves of Gen. Luis Torres, six miles from Hemosillo, and not long ago the foreman of Governor Isabel's big farm, near the capitol, was frightfully mutilated and sent to town with a note to the governor that the Indians would do the same and more to him if he ventured out of the city. Thereupon Governor Isabel removed the seat of government from the palacio to his residence, and staid within doors.

As with the officers, so with the soldiers. I have said that the government demanded that Americans going into the interior take a guard of troops; very few did so, none more than once. The troops were no protection; for at the first sign of trouble they ran; in the meantime, they lived high in camp. They are largely renegades. There was no telling which party they might shoot when the occasion came, if they should stay to shoot anyone. However, it would make little difference except for the moral effect and the noise whom they shot at. Their marksmanship is not of the best. Their marksmanship is not of the best. ican Republic to make good in this matter. Here is a desultory war that a handful of poor men, goaded by oppresion and cruelty for a generation, has successfully waged against a great nation. Surrounded by troops, inclosed in a little region of rivers and cañons; shut off from many of their waterholes with arms, clothing, supplies, food, cattle carefully kept from them, yet they have for many years made the region a desert and terribly unsafe. The Mexican people are on trial before the civilized world and an accounting must come. They are passing through the struggles this nation fought out in the southwest in its Apache and Navajo wars and they have had ample time to conquer, if conquest was the desirable thing. It is against the genius of modern civilization that a mere handful of resourceless people like the Yaquis should longer terrorize a great state, paralyze its commerce, devastate its ranches, its mines, its haciendas, and set at naught the efforts of a great nation to maintain peace within its borders. The condition is intolerable and unnecessary. Sonora is a state of vast resources in agriculture, mines and timber; these are now valueless, traffic and travel are impossible, agriculture is ruined, mining is abandoned, ranches are destroyed and cattle are dead for want of care, their owners bankrupted. Capital is driven out, enterprise is dead. Such a condition is indeed strange for a civilized nation in the twentieth century.

Hundreds of these Yaquis have been deported to Yucatan; of these many have toilsomely worked their weary way back and are again in arms against the power that sent them to slavery and expected their death in the bleak and rocky peninsula. This policy might be of avail if the authorities could send out the right men; but these shipped have been chiefly women and children and men working quietly in the towns and cities and on occasional haciendas. The hostiles have not been deported, for they could not be caught. They have been hanging above the passes and on the brinks of cañon with finger on trigger and eye at sight. They have been watching and ready to swoop down on undefended ranches and haciendas in the absence of troops or guards.

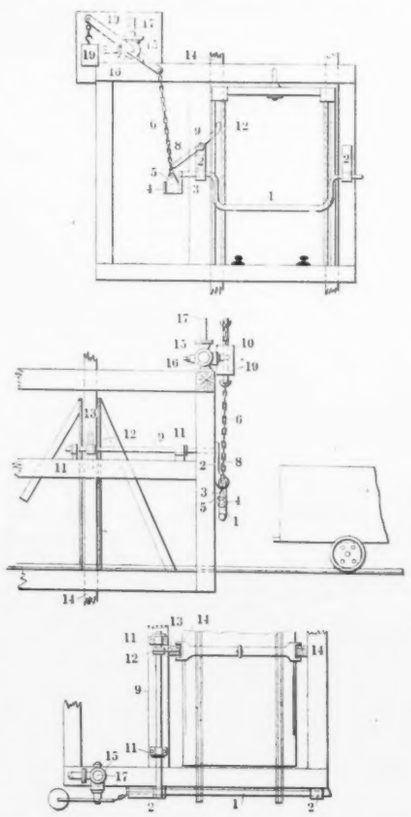
Today the state of Sonora is a hot-bed of hostile criticism of government methods. The feeling is very high, higher than ever on account of the hope that, a month ago, was in every man's heart that the scenes of bloody cruelty were over, and that peace was come. The disappointment is poignant. Criticism is going deeper than ever and extends to the causes of the situation, to the attitude of the central Republic government and to the alleged acts of many officials. June 15 was the date set for final signature of the treaty, and by August 1 the entire Yaqui region was to be safe. But today the border is alive with rumors of murders and crime.

In justice to both sides it must be remembered that a great many of the outrages alleged to have been committed by the Yaquis, have doubtless been by Mexican hombres, bad men, who have profited by the state of insurrection and are robbing and killing under cover of it, and with the expectation that their acts will be laid to the renegade Indians. Sonora never had so many of this despicable class as today, and an iron hand, such as Emilio Kosterlitzki's, will be needed to restore order after the Yaqui trouble has been set at rest.

It is said that old phosphorized copper tubes make gun-metal hard, and make good phosphor-bronze.

Safety Device for Landings

A device is described in *Der Bergbau*, April 30, 1908, which is designed to prevent a car from being pushed into the shaft before the cage is properly landed to receive it. The device, shown in the accompanying sketch, consists of the bent bar 1, supported at each end by the brackets 2, fastened to the two posts of the station framing. One end of this bar carries the rigidly attached lever 3 and pin, 4. On the latter is placed the loop 5, to which is connected the chain 6. The levers 8 and 10 are fastened to this same chain. The lever 8 is rigidly connected to the shaft 9, to the other end of which is



ARRANGEMENT OF STATION FRAMING, SAFETY LEVERS, ETC.

fastened the lever 12, which plays through a slot in the wooden guide 14. The lever, 10 actuates the valve of the whistle 17, in such a way that when the weight 19, falls, it opens the end of the compressed-air pipe 16, and blows a blast on the whistle.

If, now, the bar 1 is raised sufficiently to permit the passage of a car under it, the cage not being at the station, the weight 19 lifts the end of lever 8, thereby throwing the lever 12 toward the shaft, and at the same time blowing the whistle. If the cage is standing at the station, the lever 12 cannot pass through and beyond the guide, whereby the weight is prevented from falling, even when the bar 1 is lifted, and the whistle remains silent.

Mill Construction in the Joplin District

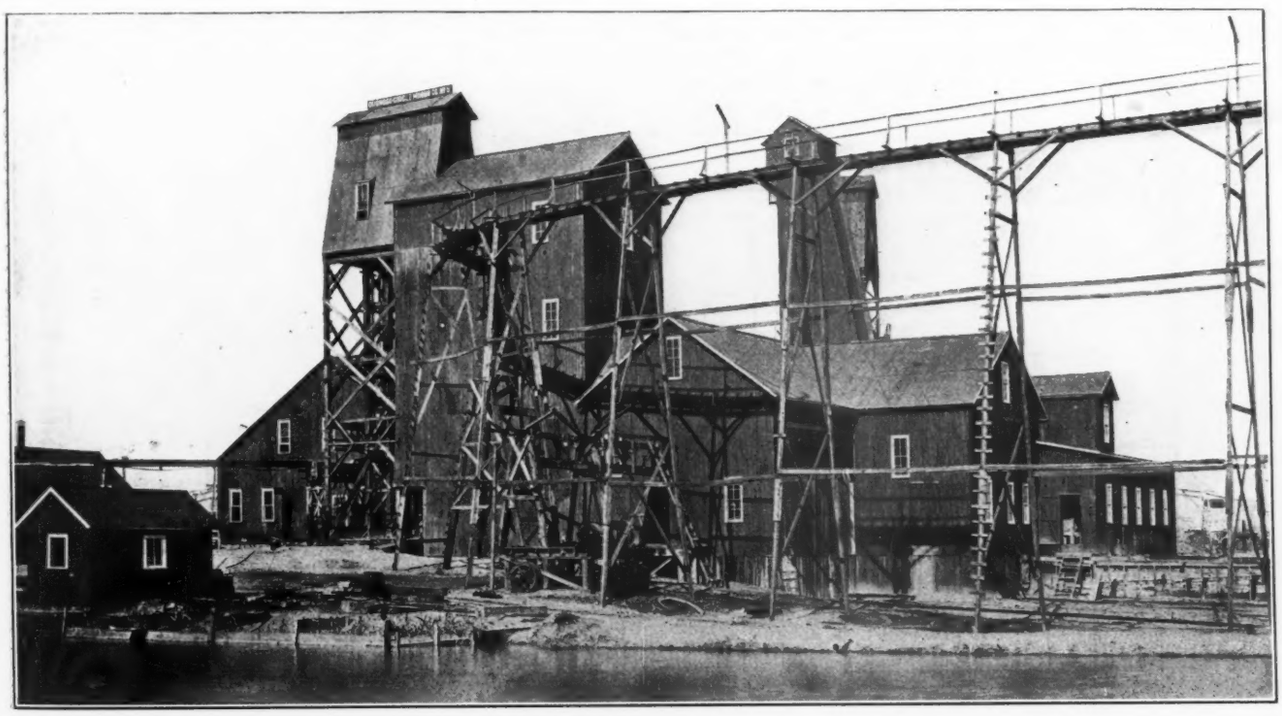
Increased Capacity Has Introduced Changes in Practice and Probable Removal of the Building to a New Site Is Provided for in the Plans

BY OTTO RUHL*

The development of the lower-grade orebodies in the sheet-ore belts of the Missouri-Kansas district has resulted in the construction of mills of larger capacity. This increase in capacity from 100-ton plants to 200- and 1000-ton mills has taken place during the last four years and has greatly increased the importance of design and construction.

The increased capacity of the mills makes it necessary to employ larger and additional machinery such as rougher and sand jigs, screens, elevators, settling boxes and concentrating tables, with a corresponding increase in the power equipment; all requiring floor space and larger buildings. Since the introduction of natural gas and electric power, coal is seldom used and the room formerly occupied by coal bunkers provides the necessary room for air compressors and additional engines and boilers. The long rectangular form of building is preserved; both length and breadth have been increased. The power-house is either an ell of the main building or entirely separate. The latter method is becoming popular when power production involves the use of boilers, for the separation of the buildings is a security against fire.

In addition to the typical form, there are a few mills of irregular design, a notable example of which is the gravity mill at the incline shaft of the Electrical Zinc and Lead Company north of Webb City. The ground plan of the Deacon mill shows the pronounced long rectangular type while the plant of the Oronogo Circle No. 5 shows a modification of the same form. The dimensions of the modern mills are from one-third to one-half greater in width and from one and one-half to twice as long as the older mills.



ORONOGO CIRCLE NO. 5, SHOWING HEAD FRAME, HOPPER AND FORM OF MILL

Foundations and Building

Larger machinery requires especially firm foundations. All rolls, jigs, elevators and tables are placed upon concrete foundations. The frame-work of the mill which must stand the strain of shafting is all supported by concrete piers. Even with the best of care the vibration of the mill is troublesome; it throws machinery out of alinement and loosens bolts and nuts. An improvement could be effected by manufacturers of machinery by putting in keys in bolts not subject to constant regulation.

Formerly the framework was mortised and spiked. Present practice avoids this as far as possible, substituting with ¾-in. bolts or lag screws. The purpose is to preserve the framework when it becomes necessary to remove the mill to a new site.

Trussed framework was formerly used as a support for both roof and shafting. The latest method involves the erection of a separate set of rafters to secure the roof. This does away with some of the vibration and renders it possible to make repairs in the shafting framework without interference from the roof structure. In the Mercantile mill, north of Webb City, the framework is made of steel; but the majority of the mills retain the wooden frame.

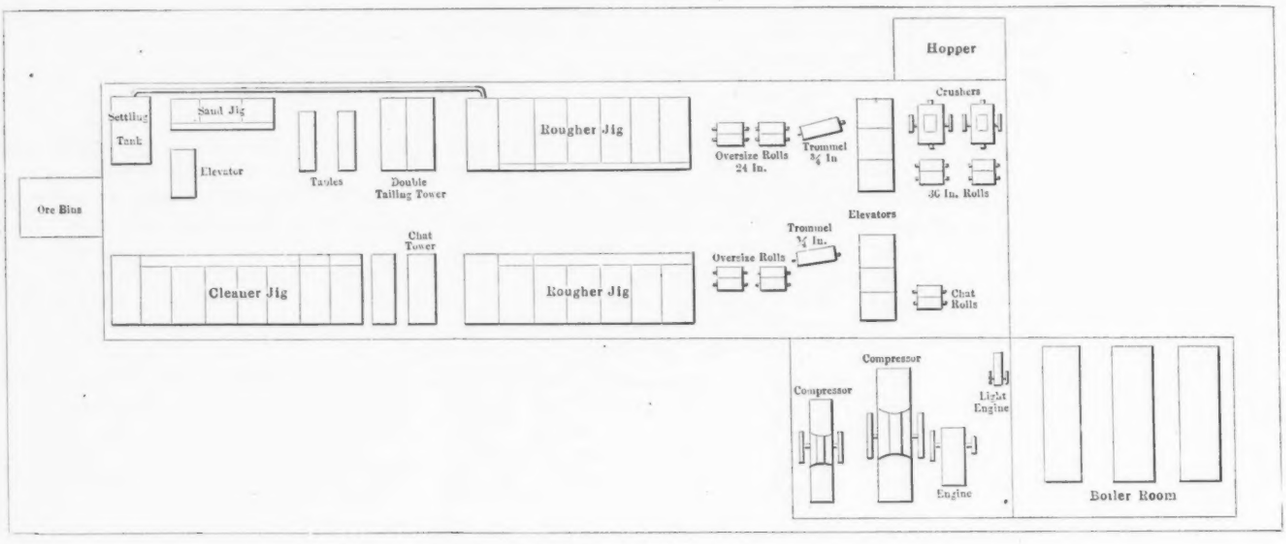
Another departure in recent building is the substitution of sheet iron and galvanized sheets as a covering for both sides and roof. This practice is widely adopted, and has proved most satisfactory, embodying as it does durability, protection from fire, and ease of removal with small waste.

*Webb City, Missouri.

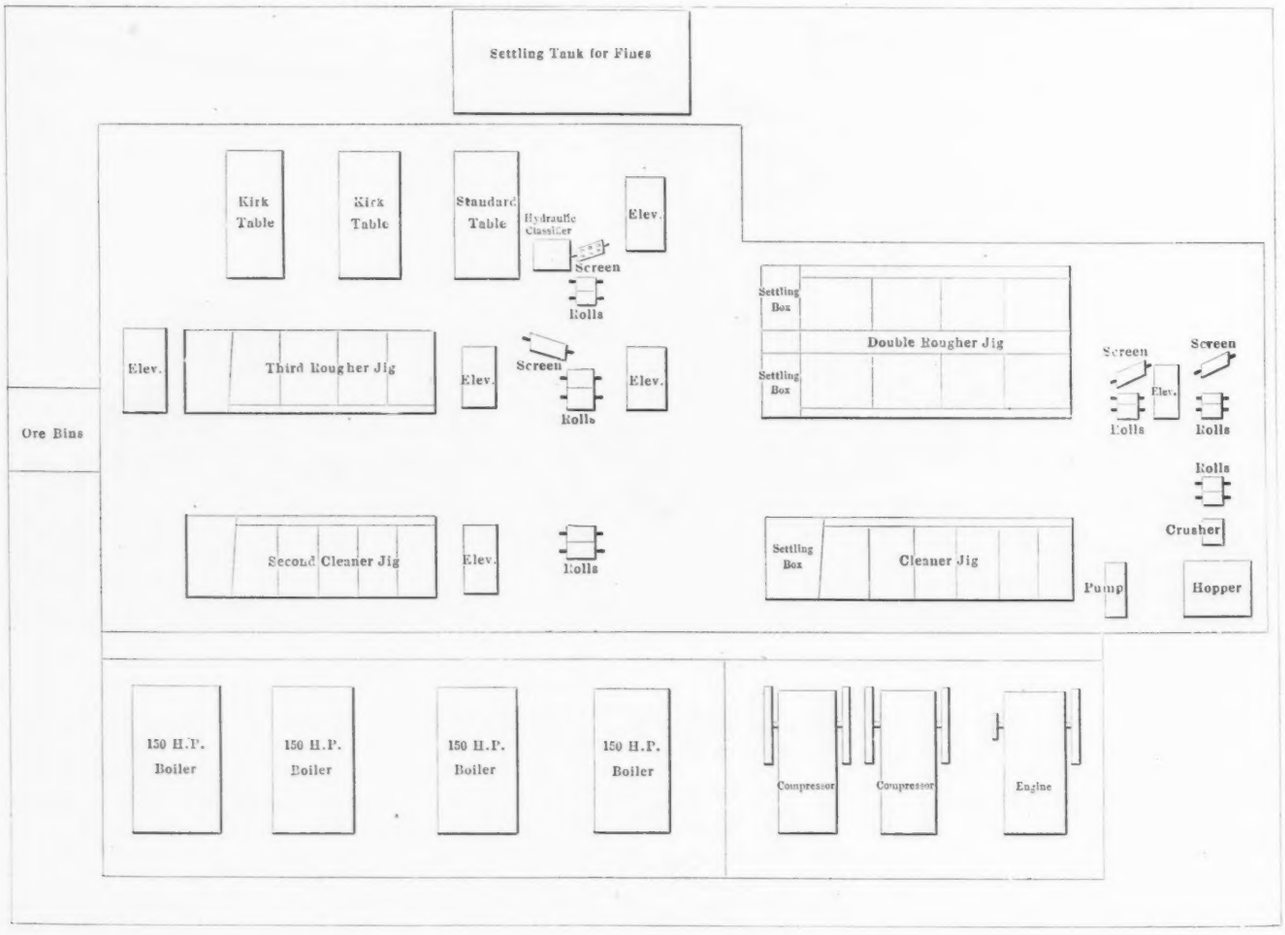
JIG CONSTRUCTION

The cells of the jigs used in mills of the old type have been enlarged from 28x30 in. to as large as 34x48 in. Another change has been the reduction in the number of cells in the rougher jigs in many of the later mills from five and six cells to four. The increased size and weight to be borne by these jigs has led to the abandonment of all methods of construction but one, that of laying the walls with 2x4-in. strips of planking well calked with wicking. For the same reason jig foundations are provided by building concrete piers under each end of the jig and often under the center.

The construction of mills having a capacity of 300 tons or more, calls for the installation of at least two rougher jigs. These will treat 300 tons of ore per day, and the product can in turn be handled in a six-cell cleaner jig with 28x42-in. cells. In this case, however, the chat product of the roughers must be provided



GROUND PLAN OF THE DEACON MILL



GROUND PLAN OF ORONOGO CIRCLE MILL NO. 5

for by the use of another jig or the first two roughers must be exceptionally large in proportion to the cleaner jig. At the Oronogo Circle No. 5, where the cells of the two roughers are 34x48 in. and those of the cleaner are 28x42 in., a second rougher and cleaner jig handle the chats; but at the Deacon mill, where the cells of the two roughers are 34x48 in., the cleaner cells are but 30x32 in. and the roughers rehandle all the chats.

The use of sand jigs has with few exceptions become the established practice in all places where large quantities of sandy ore are produced. These jigs are modeled after the rougher and cleaner jigs but have smaller cells. They have from five to seven cells which vary from 22x32 in. to 26x38 inches.

Screens and Frames

The installation of more sizing screens is a new feature in local mill construction. In all the new mills the ore passes over a ¾-in. grizzly before going to the crusher. The undersize goes directly to the dirt elevator. This arrangement increases the capacity of the mill, and in sheet ground where blasting breaks the ore into fine particles, fully one-quarter to one-third of the dirt never passes through the crusher and first set of rolls; fully one-third to one-half of the undersize from the screen to the second set of rolls goes directly to the rougher jig.

A screen is now universally placed after the chat rolls. The material sent to the sand jig is screened. The sands and slimes fed to the concentrating tables are passed through 1½-mm. screens; and in a very few mills hydraulic classifiers are installed. Formerly all screens were of the trommel type, but present practice favors the less bulky shaking screens.

The introduction of the grizzly at the head of the crusher, with the ore hoppers now used, has changed in a slight degree the old plan of arranging the crushing machinery. These two features have made it possible to lower the crusher and first set of rolls, which are usually on a combination frame, to a point where the discharge end of the rolls is just high enough to discharge into the boot of the elevator. This change gives the crusher a better foundation; which it needs, because the increased size of the crusher and the greater vibration are factors difficult to meet with the old high crusher frames. In some cases, where permanent structures are built, both crusher and rolls are set directly upon concrete piers with only one set of timbers intervening.

Gravity Bin Feed

The old crusher room where the ore was dumped and fed into the crusher by two to four shovelers has been entirely discarded. In its place has been erected a gravity bin much higher than the old room, requiring an elevation of the hoister house. The floor of the bin is sloped to a gate which discharges upon the grizzly. One man is necessary to keep this in operation. The bin is usually built to hold twice the capacity of the mill. To support the bin heavy timbers, 8x8 in. or 10x10 in., are used, set from 3½ to 4½ ft. apart and resting upon a concrete foundation.

At one side of the bin is the shaft and hoisting headframe. Often one set of timbers is used to support one side of both bin and headframe. The heavy timbering and the weight usually in the bin is of great assistance in steadying the hoisting room and controlling the vibration caused by the hoisting engine. The floors are made of 2x12-in. oak plank, often doubled and crossed. The walls are also 2x12-in. oak. In addition to heavy bracing, the walls are bound with truss rods.

The advantages of these bins are manifold. They reduce the labor required from three and four men to one man. They increase the capacity of the mill. They provide material for the mill should the mines be idle for a short time, and storage capacity for ore in case the mill is shut down.

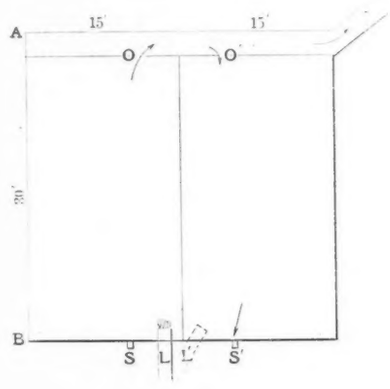
Settling Boxes and Tanks

The mill practice of the district now makes some effort to save the fines. The devices employed for this purpose are divided into two classes, settling boxes for jigs and general settling tanks for the fines from the entire mill. The type in most common use consists of a 2-ft. extension of the jig to which it is attached. It is as wide as the jig cell emptying into it. A partition divides the box into two portions at the top, the partitions extending only a portion of the way down, usually within 20 to 24 in. of the bottom of the box. At the bottom is a spigot to draw off the hutch while up the side of the box just above the bottom of the partition is the overflow orifice from which the water goes to a general settling tank. This method effects a separation of the coarse and fine products coming from the jigs. When the entire product is desired, as in the tails of the cleaner, the overflow does not occur at the bottom of the partition but at the very top of the box.

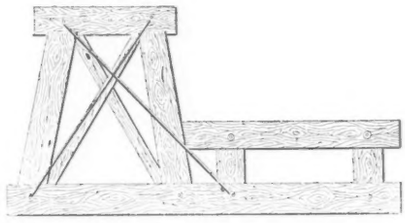
The general settling tanks are large, the larger the better for accomplishing their purpose. They vary from 20 to 50 ft. square, and are built of substantial timbers well braced and rod trussed. The floor is always sloped to a common point near the sand and slime elevator boot in the mill. They are usually built on the outside of the mill adjacent to the table room. The tank is subdivided into two equal compartments by a partition. At the end of each compartment is a common overflow launder. At the other end is a movable launder which brings the material from the jigs. From the overflow launder enough water is admitted to the filled compartment to wash the sand and slime to the sand elevator boot.

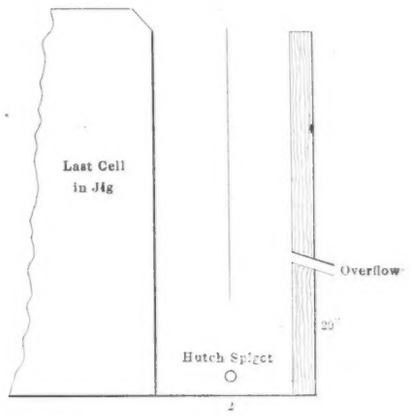
Capacity and Duplication

One of the most important features of present mill building is the method utilized to increase the capacity. Besides building larger machinery the principle of duplication is used with marked advantage. The limit in size of jig building is probably reached in the construction of a rougher jig with 34x48-in. cells. Therefore to further increase capacity another jig must be added. This principle is also



PLAN OF SETTLING TANK


ROLLS AND CRUSHER FRAMES COMBINED



CROSS SECTION OF SETTLING BOX

carried out with regard to crushing and screening machinery, which necessitates a new arrangement of the plant. In the Deacon mill the duplication is so arranged that the machinery forms a perfect duplicate mill up to the cleaner jig. If a break occurs at any point ahead of the cleaner jig, the whole mill is not shut down, but only the part in which the break occurs. In the Oronogo Circle No. 5 and the Yellow Dog, the duplication is differently arranged.

Moving the Plant

Since the average life of a mine is only five years in a larger part of the district, and since even in sheet ground the orebody is stoped out so far from the mill that the cost of tramming becomes too great a factor in the cost of production in from four to seven years, provision must be made for moving the mill to a new location.

In planning a mill it should be borne in mind that no mining is permanent in this field. Even on the sheet ground, the permanence of which has been the subject of a large amount of favorable comment, there have been at least four cases of mill removal in the territory north of Webb City in the last three years. It is therefore advisable to utilize every means to make easy removal a feature in construction. The removal and erection of mills used on other property forms a large part of the business of certain mill contractors. Many operators, especially where developing an uncertain orebody, buy a second-hand mill and remove it to the site desired. The cost is about one-third to one-half that of a new mill.

Cost of Construction

The cost of mill construction is a variable quantity depending upon location, kind of practice, capacity and material. The difference in the cost of the old 100-ton mill and the 100-ton mill of today is largely a matter of the increased cost of material alone. But with sheet ground, other factors arise that include additional items of expense. In the first place, 100-ton mills are unable to make a profit and capacity must be considered. The minimum capacity is 200 tons, the maximum 1000 tons. The cost of the mills will then be from $15,000 to a maximum of $160,000. There are essentials and non-essentials in mill construction, and in the building of any plant no estimate of cost should be attempted until the actual character of the ore, its quantity, water conditions and general location are known. With these conditions known the size of mill, type of mill practice, and cost can be very accurately determined.

Cast-iron freight-car wheels are sold under a guarantee of 70,000 miles. In actual service the average life is fully 100,000 miles.

Lateritic Decomposition

In a recent communication to the Société de l'Industrie Minérale, J. Chautard and Paul Lemoine gave the results of their investigations into the nature of laterization, showing particularly the way in which this decomposition process has been responsible for the formation of certain deposits of bauxite, of gold and of iron ores. By laterization is meant that superficial decomposition of feldspathic rocks, peculiar to the tropics, whereby a residue rich in alumina and iron but poor in silica is left behind. Its counterpart in temperate climates is seen in kaolinization, in which process the silica is not removed but enters into combination with the alumina, forming residual beds of clay. Kaolinization is also observed in the tropics. Laterization extends to depths of 100 ft. or more, and over immense areas so effectually alters the structure and appearance of the original rocks as to make their recognition almost impossible. Kaolinization, on the other hand, rarely extends to so great a depth.

The rocks on which the present investigation was made came from French Guinea, on the west coast of Africa, and were taken from a railroad cut on the line from Conakry to the Niger. The samples included undecomposed diabase and the laterite surrounding and resulting from it. The latter material retained its compactness, and the ferro-magnesian silicates in it retained their shape and appearance, but the feldspars were partly kaolinized. Analyses showed that, as a result of this first stage of decomposition, the lime, magnesia, soda and potash had almost completely disappeared, that the silica had been considerably reduced in amount, and that the alumina, iron and titanium had increased. In the case of another diabase and the laterite derived from it at a more advanced state of decomposition, it was found that the alumina had increased from 14.18 per cent. to 47 per cent. and the iron (metallic) from 9.7 to 27 per cent.

Similar investigations on ophites (fine-grained diabases in which the augite is in excess of the feldspar) showed that the process of laterization is less rapid than in ordinary diabases, suggesting that the texture of a rock has some influence upon its susceptibility to laterization. Finally, analyses of a phyllite and its decomposition product showed that the latter had none of the characteristics of a laterite, thus proving that only those rocks rich in feldspars and ferro-magnesian silicates are susceptible to laterization. Shales and slates, which are generally considered as an intermediate form in the decomposition of feldspathic rocks, do not seem to be subject to laterization.

The characteristics of laterization may be summed up thus: (1) Liberation of iron and alumina from their combinations with silica; (2) oxidation of iron from the ferrous to the ferric state; (3) liberation of silica and its various compounds; (4) loss of silica, alkalies and alkaline earths; (5) a residue greatly enriched in iron, alumina and titanium, and poor in silica.

Deposits of bauxite in various parts of the world seem to have been the practical result of lateritic decomposition. A recently discovered bauxite deposit on Boulanger creek, Guiana, carrying 64 per cent. alumina, and practically free from silica, is a notable example. Bauxite deposits in Europe and the United States can also be similarly accounted for. The bauxite deposits of Provence, particularly, show so marked variations in appearance and quality as to preclude any theory supposing them to have been formed by decomposition in place, under hydrothermal activity, by the action of aluminum chloride upon limestone, etc. It is easy to believe that these deposits may have been formed by the transportation and deposition of laterite derived from previously existing rocks. The Arkansas bauxites seem to have been formed by laterization of syenites in place.

Deposits of iron ore, ranging from limonite almost to hematite, are also attributable to laterization. Extensive deposits of this nature are found in tropical Africa, in Guiana, in Madagascar and in India. Some of these deposits might be profitably exploited even now, and will form valuable resources for later times.

By this same process, the gold contained in feldspathic rocks is set free, to be lodged ultimately in alluvial deposits. The gold in the streams of West Africa, Madagascar and Guiana may be accounted for on this supposition.

Duty on Hematite Iron Ore

In the case of certain importations of hematite iron ore made by the firm of Francklyn & Ferguson, the collector of the port of Philadelphia assessed the merchandise with which this case is concerned at 30 per cent. ad valorem as a pigment, under paragraph 58 of the tariff act of July 24, 1897. The importers claimed that it was properly dutiable as iron ore under paragraph 121 of that act at 40c. per ton. The Board of General Appraisers sustained the claim of the importers, and on appeal from that decision the circuit court entered an affirming decree, holding that the material in question was undoubtedly iron ore, not being a pigment unless submitted to further manufacture.

The estimated world's production of lead in 1907 was 964,910 metric tons, as compared with 968,174 tons in 1906.

"Lead and Zinc in the United States"*

By R. W. Raymond

This book is one which ought to have been written, and the work of writing it has fallen into the right hands. I pronounce that just judgment with some inward pain, as may be inferred from the following explanatory statement.

The book is not a scientific manual, but a history. As the preface declares it has been prepared at the request and with the assistance of the Carnegie Institution, as a part of the Economic History of the United States which that generously endowed and wisely administered body proposes to compile and publish. Having been actively engaged for 45 years in mining and metallurgical practice within the United States; and having furnished in the eight volumes (1868 to 1876) of my reports to the Government, as commissioner of mining, much historic material concerning the progress of these industries and the arts which they represent: and having been since 1867, as editor of the *American Journal of Mining*, and editor or special contributor of the Engineering and Mining Journal, in the position of chronicler and critic of the wonderful progress, "all of which I saw, and part of which I was;" and finally having been almost continuously since 1871 an officer of the American Institute of Mining Engineers (since 1883 its permanent executive secretary) and thus in contact with the leaders of American practice in mining and metallurgy, I have cherished the dream that I might some day bid for fame as the historian of those movements and enterprises in which I had been actor, adviser or observer. Since my professional career approximately coincides with the period of that conquest of the continent in which mining has taken the lead, this ambition was not unreasonable. But the subject has grown too large for the grasp of any single man—especially of one who, though old, is still busy; and the different departments of it are receiving treatment at the hands of younger men, upon whom I bestow, with a sigh of transient regret, my hearty praise. I am consoled to find, in this case, that Mr. Ingalls has made good use of much crude material, gathered and published by me many years ago.

I may be pardoned if I praise more particularly that part of his book which deals with the subject most familiar to me personally, namely the smelting of lead ores. It is in this line that American metallurgists (or to speak more accurately, metallurgists educated in Germany, but qualified by knowledge and temperament to cut loose from the traditions, while retaining the scientific principles of their previous training) took the lead in revolutionizing the accepted methods of the world.

Mr. Ingalls' admirable review of the progress of lead-smelting in the United States affects me in a peculiar way. I did not imagine that the simple history of an art could so arouse my emotions. But this narrative is marked throughout with names which recall to me old friends and colleagues, whose early struggles I watched, whose achievements I recorded and whose departure from earth I have been in too many instances called to mourn. I remember vividly, for instance, the situation in the Salt Lake valley 40 years ago, when a host of little shaft furnaces were running intermittently, each on the ores of its own mine; when it was good practice not to have oftener than once in eight days a "salamander," requiring the stoppage of smelting, the removal of part of the furnace wall, the forcible "yanking-out" of the salamander (sometimes with the aid of a yoke of oxen), and the rebuilding of the front, preparatory to a resumption of operations. In those times glancing around the horizon on any morning, I could infer from the absence of this or that column of black fumes (for nobody saved the flue-dust then) which furnaces were "bunged up" that day. I remember one furnace, the manager of which, ashamed of the great number of salamanders which lay around his stack, buried them all under the sage-bush in the neighborhood. Perhaps, centuries hence, when his operations shall have been forgotten, these strange half-metallic masses may puzzle the scientists of the future and lead to new hypotheses as to the genesis of ore deposits!

I remember also a furnace built on the north shore of the lake by an enterprising metallurgist experienced only in the cupola practice of iron foundries, which was provided with a hinged bottom-section, intended to be opened so that a salamander could be dropped out before it became so big that it would have to be dug out or hauled out.

And I remember that some of the leading managers, knowing that oxide of iron was useful as a slag-making material, and afraid of the possible effect of other constituents, brought a pure red hematite all the way from Wyoming Territory, and charged it into their furnaces as a flux, costing them $30 per ton.

The situation was characteristically American. A multitude of energetic and courageous, but ignorant men were attacking problems which they did not understand, attempting the impossible and the practicable with equally gay audacity, and getting their education rapidly, but at high cost. On the other hand, there were men on the ground, more or less thoroughly trained in foreign schools, but not able in practice to adapt traditional methods to new conditions. The leadership in substantial progress must be conceded to a few trained metallurgists, who combined a knowledge of "the state of the art," as they had learned it abroad, with the American spirit of bold adventure under novel surroundings. Among these I must name Augustus Steitz, whose untimely death in 1876 cut short a career of great professional promise; Charles A. Stetefeldt, who lived to impress his name indelibly upon the history of our metallurgical progress; and Anton Eilers, O. H. Hahn, Franz Fohr and August Raht, who still survive as leading practitioners, authorities or advisers in the art they have done so much to advance and perfect. Stetefeldt, Eilers and Hahn, as I am proud to recall, were among the young men who, more than 40 years ago, began their professional career in this country as assistants employed by the firm of Adelberg & Raymond, consulting mining engineers and metallurgists, of which I was the junior partner. They all came from the old mining school of Clausthal, in Hanover, as did other assistants of ours, notably Herman Credner, afterward professor at the University of Leipzig and director of the Royal Saxon Geological Survey. I bear hearty witness to the intelligence, skill and fidelity of the Clausthal men, of whom I have employed so many, and so many of whom have since achieved high professional reputation.

It was at the third meeting of the American Institute of Mining Engineers, held at Troy in November, 1871, that I presented a paper on the smelting of argentiferous lead-ores in Nevada, Utah and Montana, with the names of Hahn, Eilers and myself as joint authors. It is unnecessary to say that my share of the work was little more than to put together in coherent and logical form the material supplied by my associates. I think I may safely claim for the paper that it constituted a clear statement of the best existing American practice, including some improvements, then new, but destined to be generally accepted, and some prophecies of progress which were afterward fulfilled. Mr. Ingalls has recorded with impartial intelligence the successive steps of ingenious invention or courageous advance upon existing lines, which eventually placed American practice in this department at the front. I need not repeat the history; but, without disparaging in the least the merits of others named by him, I wish to emphasize the peculiar service which Anton Eilers, as the general manager of important works at Salt Lake, Leadville, Pueblo, Great Falls and Helena, was enabled to render to progress in this art through the training of numerous metallurgical subordinates in all departments of management. It is impossible for me to name all those who graduated from this practical school to achieve distinction elsewhere. But I may

*"Lead and Zinc in the United States." By Walter Renton Ingalls. Pp. 368; illustrated. 6¼x9¼ in.; cloth. $4. New York and London, 1908: Hill Publishing Company.

mention without unfair partiality Walter H. Aldridge, now at the head of all the mining and metallurgical operations of the Canadian Pacific Railway, and Arthur S. Dwight, long and favorably known as the manager successively, and always successfully, of several great metallurgical works, and for some time member of the "operating committee" of the American Smelting and Refining Company, and more recently distinguished as one of the inventors of an important improvement in metallurgy, which was described in the ENGINEERING AND MINING JOURNAL of March 28, 1908.

I have lingered too long over that part of Mr. Ingalls' book which reviews my own personal reminiscences, but so much must be pardoned to an old veteran, stirred by the story of a great campaign, all of which he saw, and part of which he was.

Mr. Ingalls has treated the other branches of his subject with equal skill and thoroughness. Here too, I must confess, I have some slumbering memories of persons and events, which might easily awake and become clamorous. But I shall take care not to disturb them; and fortunately they are not so lively as those respecting which I have indulged in utterance above, and I may, therefore, say something in a general way without arousing them.

The story of zinc, as here told, is, in one particular, at least, even more dramatic than the story of lead. It is true that, in the early days, lumps of lead carbonate were thrown out of the gold digging sluices near Leadville as worthless nuisances. But lead was never regarded like zinc as a nuisance to the smelter, and no smelter ever made heavy deductions from the prices he paid for ores on account of the lead they contained. Consequently, the metallurgical and commercial improvements affecting zinc and its ores have largely transformed a dreaded and despised mineral into a welcome source of revenue, and the basis of an immense industry.

Mr. Ingalls' book thus becomes a double epic, and takes a well deserved high place in the grand new history which, coming from such skilful and sympathetic hands as his, is to instruct and inspire this generation.

The Smelters at Anaconda *

BY E. P. MATHEWSON†

Marcus Daly selected Anaconda as the site for the smelter of the Anaconda Copper Mining Company on account of the good water supply. The Upper Works, on the north side of Warm Springs creek, were begun in 1883, under the direction of the late William McCaskell. They were designed to treat 500 tons of ore daily. They consisted of concentrator, hand roasters and small reverberatory matte furnaces. They were put in operation September, 1884.

These works were reconstructed in 1886, when steam stamps were substituted for crushers and rolls in the concentrator, following the practice of the Lake Superior concentrators. These changes were made under the direction of Otto Stalmann and the capacity of the plant increased to 1000 tons daily. Brückner roasting furnaces were introduced at this time and were a marked improvement over the old hand roasters.

As the mines increased their output, more smelting capacity became necessary; so, in 1887, construction of the Lower Works, about one mile further east, was begun. There was considerable delay in building, and fire destroyed the works shortly after they were built. It was not until late in the fall of 1889 that they were again put in commission. They had a capacity of 3000 tons daily and were, at the time of their construction, the best equipped copper smelting works in existence. The buildings were of iron and many new devices and appliances were introduced. As far as possible gravity and machinery were substituted for manual labor. This gave for the two plants a combined capacity of 4000 tons of ore daily.

The first converter plant was put in commission in 1889. The second converter plant, at the Lower Works, was built under H. W. Hixon's direction in 1892. The first experimental refining plant, built in 1888 under Mr. Thofern, was enlarged and improved in 1892. This plant was not required after 1903 on account of large refineries being built at Perth Amboy, N. J. It is hoped that it may soon be again in commission, as the newer portion is constructed and fitted out in the most improved style, while the older part can be brought up to date at slight expense.

About 1898 Mr. Daly decided to enlarge the smelters, but could not see how it could be done economically, so he changed his plans and chose the site of the present Washoe smelter for a new plant entirely. About this time F. Klepetko was given charge of the "Old Works," and he immediately set about planning the new Washoe smelter. The work of construction of this, the world's greatest copper smelter, was begun in 1900, and the first ore was unloaded at the new plant Jan. 23, 1902. A month later operations were begun in the concentrator. The plant was designed to handle 4800 tons daily in the concentrator and a thousand tons at the blast furnaces. The plant was soon found to be too small for the increased production of the mines. So changes and additions were made, until today it has a capacity of 12,000 tons of ore daily. It enjoys the distinction of being the largest copper smelter in the world, turning out 15 per cent. of all the copper produced in the world, or from 20 to 25 per cent. of all the copper produced in the United States. It employs 2000 men; its monthly payroll is $215,000.

In addition to the smelter the Anaconda Copper Mining Company operates a firebrick plant, installed years ago to make a refractory brick to take the place of the Dinas brick, which were imported from Wales at great expense. It has not only produced a substitute for the Dinas brick, but has driven the Welsh brick out of the market of the western copper-producing States. The brick manufactured at Anaconda are today acknowledged to be the best in the world. The plant employs 45 men.

The company, to avoid excessive charges on castings, etc., from San Francisco and Chicago, established what was first known as the Tuttle Manufacturing and Supply Company, afterward the foundry department of the Anaconda Copper Mining Company. This establishment is fitted up with modern metal-working machinery and employs at present about 175 men and does, practically, all the foundry, boiler and machine-shop work for the mines and smelter, besides outside custom work.

The late Marcus Daly is, of course, the central figure when Anaconda or its smelter is considered. He originated the whole business. His active mind and strong personality controlled everything in Anaconda from 1883 to 1890, when, owing to ill health, he was, most of the time, away from Montana.

There were numerous superintendents under Mr. Daly, the most prominent being Mr. McCaskell, who built the first plant and who died a few years later. Then Otto Stalmann from 1886 to 1893; then John S. Dougherty from 1893 to 1899. Mr. Daly died on Nov. 12, 1900. F. Klepetko was manager of the reduction works from 1899 to 1902, when, after a short time, during which period no regular manager was appointed, the writer took charge as manager of the reduction works, holding the position at the present time.

Anaconda has the distinction of having been the home, at some time or other, of nearly every man now living who is prominent in the copper-smelting world. Anaconda smeltermen are known the world over. Anaconda's smelters have always been of the largest, and the company's policy has always been to secure the latest improved appliances regardless of expense.

*From "A Souvenir of Anaconda's Silver Jubilee, July 4, 1908."

†General superintendent of the Washoe works, Anaconda, Mont.

Reinforced cement for building chimneys gives good results provided the builder uses the proper knowledge and care in designing the chimney. Such chimneys should be constructed of wet concrete, trap rock and sand, and should be rich in cement. Due regard must be given to temperature stress.

The Human Side of a Mining Engineer's Work *

By Edmund B. Kirby†

The human side of engineering is often neglected by mining engineers, although this neglect is apt to bring delay, disappointment or failure. The special work of an engineer is to apply the discoveries and methods of science to the practical business of the world. Often he forgets how many-sided a man must be for this end, and enthusiastic and absorbed in technical details he overlooks the fundamental requirements of life. I urge you, therefore, not to forget that the world is made up of things and of folks, and nine-tenths of your business is going to be with folks.

You will gradually learn what is wanted. The business world is not interested in the details of your education. It is generally understood that the completion of a course like yours indicates that the man has made good in his first test, that he has carried through successfully his first serious undertaking. This gives promise for the future, and the fact of technical training assures ease in breaking a new man into the business. But you do not yet know that the questions an employer asks are merely these: Has he good sense above the average? What is his personal bearing and address?

The Personal Equation

You will find that a diploma is of little interest to others, but a likeable personality is a passport, good for life and in all countries. In time you are to discover that tact and diplomacy solve more problems than engineering formulas. That a memory for names and faces will help you more than one for minerals and rocks. Sooner or later you will know that good sense, that ability to decide which of any two things is the more important, is an asset beyond price. You will awake to the fact that valuable as is skill in the higher mathematics, it will never push you to the front like the ability to write a letter which will really do its work. How will you deal with people if not through language, that means by which your thought and will may reach the consciousness of others, that delicate and subtle medium necessary for the most simple affairs of daily life, yet capable under a master's touch of swaying a multitude, of moving the world? How far have you learned its use? You have studied the reactions of chemistry, but how much have you learned of those subtle human reactions which break down indifference and create friendship? But you say this wanders from engineering matters. These are the winning qualities for all men. I answer "Quite so; the successful mining engineer is the successful man."

The technical side of a mining engineer's work is and must remain its distinctive feature. Next to the fundamental requirements of life, its importance is conceded by all. It is well to recognize that the technical knowledge demanded by the mining world is broadening. The single-specialist of former days is now under a disadvantage.

The Technical Side

Mining is peculiarly subject to the caprices of fortune, to sudden changes and to the incessant shifting of conditions and of men. It is a varied and comprehensive business; at times so simple as to be within the powers of any man, again so complex as to demand every resource in the list of human attainments. It may call for profound and little known specialties of science, for the leadership of men and for the most skilled and experienced commercial powers. This wide scope and these incessant changes with their sudden promotions call for engineers who are broad enough to take advantage of the opportunities they present. What is most desired is the man with all-round training and general personal equipment, qualified to concentrate upon and acquire any specialty when necessary, but capable of being suddenly shifted and quickly adapted to any or all requirements of the business.

And now I would call your attention to the relations of a mining engineer to his profession. He will always owe it more than he can give, and the motives of obligation, as well as those of policy, impel him to do all in his power for its welfare. This duty is the more imperative because it is a young profession, only a generation old, and is not yet mature or fully organized. It has only of late been generally known or understood by the business world. During its growth, with advancing recognition, the professional spirit has steadily increased. The American Institute of Mining Engineers was the first and the most powerful means of collecting and uniting a number of scattered specialists into one self-conscious profession. Its great and long continued work has been ably seconded by the numerous local engineering societies throughout the world.

The Technical Journals

But what is not so clearly recognized is the remarkable work of the mining journals in developing the professional spirit of engineers and the feeling of fraternity among all those soldiers of fortune who constitute the mining world. Their prompt and thorough collection of news from the remotest mining districts, the eager search for every scientific and technical discovery which might be of use, their pressure for the interchange of views; these have been doing a constructive work for the entire mining world, of which it is yet hardly conscious. Today these journals stand foremost among the forces which are welding mining engineers into closer relations with each other, and with the business interests which they serve.

The growth of professional unity and interdependence has been fostered also by the continued spread of the modern idea that an engineer has more to gain than to lose by exchanging technical information with others. He parts only with what a single man can know; he receives the knowledge of a thousand men. A profession becomes powerful and is able to second individual effort only in proportion to the growth of the fraternal and helpful spirit. It is the best policy, as well as the duty, of every engineer to recognize this and to use his best efforts toward that end. Throughout your career aid your profession, its schools, its associations, its journals and its members, and for every hour, for every dollar you give it, you will receive a hundredfold.

And now a few suggestions about your life work.

Organization and Team-work

There are men who shut themselves up, and out of their inner consciousness evolve some great work, such as an invention, or a book. Occasionally also men go into the wilderness and discover a mine. But such individual play is rare and its chances are small. The real business of the world is done by team-work, and you must qualify for this. It is done by innumerable bodies of men, each of which is under some kind of organization, intended to combine its units into an efficient human machine, capable of the business on hand. Now, every such machine, whether it be a base-ball nine, a section gang, the force of a great steel plant, a railway system, or an army, works more or less badly. The individuals who compose it, from the general to the private, from the business head to the lowest employee, have human weaknesses which are much alike, and the results are friction, loose joints, lost motion and sand in the gears. Nevertheless, the outfit goes creaking along, and usually gets there, often to its own surprise.

There are weak points in abundance, not only on the human, but also on the technical side of every business. There is a best way to do each operation, but it is not always done in this best way. Moreover, methods, processes and machines are constantly changing, constantly advancing. These two conditions, the imperfection of technical methods and the faults of human organization, will provide your openings. It is because of them that the world is so full of oppor-

*Slightly condensed from an address delivered before the graduating class of the School of Mines and Metallurgy, University of Missouri, Rolla, Mo., June 10, 1908.

†Manager, Federal Lead Company, Flat River, Mo.

tunities for men who have the combination of sound technical training and good sense.

How to Win Promotion

When, therefore, you hold a job, do not waste time in complaints and fault finding. You will continually see waste and loss; things which are wrong, things which need improvement. Others see them too. If you have sense you will notice everything, but will keep your mouth shut. Some day your chance will come. Your advice will be asked. Some day you will be given charge of a small piece of work, of a few men, and may then bring out your ideas by doing this work better and more cheaply than the man before you.

An able man will move up from any job and there are no rules for fortune. But in your profession the chances are generally somewhat better for those who are able to start as workmen, or in positions close to the working force. If the machine of which you are a part is too bad, get out, but while you are in any business organization be loyal to it, uphold the hands of those above you, and keep your own work as free as possible from the faults you notice elsewhere.

Your duty now is to get busy. Get into action somewhere. If you cannot at once find work in the line desired, take anything temporarily. Concentrate yourself upon your job until sure that you are holding it down, and then turn your attention to other men and other work. Beyond this you will play the game as fortune and your own will dictate.

The Straight Men's Association

Play it straight. This may sound easy to you, fresh from the wholesome influences of your homes and the fair play of boy democracy; but in years to come, when the passions of the fierce struggle take hold of you, when copy-book maxims fail, when you see men around you winning safety, fortune and power by unscrupulous methods, unless you have higher motives for honesty than the belief that it generally pays, you are quite likely to resign from the Straight Men's Association. It is gratifying to be able to tell you that you will find your profession much above the average in its percentage of clean men.

It may some time be of service to know that to be fired from a job is often the best thing that can happen to a man, if he is really built of the right stuff. It galvanizes him into life, jerks him out of a rut, tests his own resources and makes him start fresh in new surroundings and with new people.

Errors may not be Fatal

Throughout your career you will make errors and have occasional bad falls. Avoid the delusion that such occurrences are fatal. No error is serious, unless you fail to learn its lesson, or allow it to weaken your courage. Some of the most successful men I have known had failed so many times that they stopped remembering. Because they stopped, they succeeded. If by the caprice of fortune, any of you should eventually meet with disappointment, if you should fail to realize your hopes and ambitions, you will by that time have learned that your only failure has been to escape the common lot of man. You will by that time understand the Arizona saying, "Life ain't in holding a good hand, but in playing a poor one well."

Your destinies will be determined by the mingled influences of ability, hard work and pure luck. Capricious fortune will deal kindly with some of you and roughly with others. Some of you will reach wealth and power, others will not. As your head swells with success, do not forget how much of it is due to chance. Do not forget a struggling classmate. In a few months the petty differences and jealousies of your college life will have passed into oblivion, but the man who has rubbed shoulders with you through that experience has a grip and password that you cannot forget. Throughout the world, among the yellow, the brown, the black and the white, it is the law that the call of a comrade must be heard.

The Jumau Copper Leaching Process

For several years Lucien Jumau, of Paris, has been developing a copper-leaching process which has been the subject of a large number of patents. The first was granted in France in 1905 and has been frequently amended.

It has long been known that when cupric sulphate is heated in solution with sulphurous acid, a salt of copper is precipitated and free sulphuric acid is formed. This reaction has been practically employed in the leaching of copper ore. Jumau observed that when a salt of copper is heated in a closed vessel under pressure in the presence of sulphurous acid, the copper salt is reduced to pure metallic copper and the sulphurous acid is oxidized to sulphuric acid. On this reaction he bases his patent claims.[1]

The process is carried out as follows: The sulphate of copper solution, obtained by leaching the ore, is treated with sufficient sulphurous acid to complete the equation

$$Cu\,SO_4 + SO_2 + 2\,H_2O = Cu + 2\,H_2\,SO_4.$$

The solution is then run into a digester made of copper or iron, lined with lead. The temperature is gradually raised as high as possible. Jumau finds that the yield of copper increases with the temperature and decreases as the concentration is increased. The increase of yield corresponding to increased temperature is shown by the following results. In all cases the original concentration was 25 grams of copper sulphate per liter: 140 deg. C., 47 per cent.; 155 deg., 62; 167 deg., 65; 190 deg., 79. When saturated solutions of sulphurous acid are used the pressure rises rapidly with the temperature owing to the tension of aqueous vapor corresponding to the concentration and temperature and to the pressure of the sulphur dioxide.

The pressure of the sulphur dioxide may be diminished by using only sufficient sulphurous acid to satisfy the theoretical equation, avoiding saturation, and by applying the heat gradually. Another method advocated by the inventor is to heat the aqueous solution and then gradually to introduce the sulphurous acid in gaseous form, under pressure, in such a way as to insure its conversion into sulphuric acid and to avoid saturation.

Sulphites may be used instead of the sulphurous acid. These supply another means of increasing the yield at a given temperature without having a pressure in excess of that which corresponds to the tension of aqueous vapor. If normal ammonium sulphite is employed the reaction is:

$$CuSO_4 + (NH_4)_2\,SO_3 + H_2O = Cu + 2\,NH_4\,HSO_4.$$

When ammonium sulphite is used it may be prepared by passing sulphur dioxide, produced during the roasting of the ore before leaching, into a solution of ammonia. The ammonia is constantly regenerated by heating the ammonium sulphate produced when the copper is precipitated by lime. Ammonium bisulphate may be reconverted into ammonium bisulphite by heating.

When an ore does not contain sulphur, copper sulphate may be directly converted into metallic copper by heating it under pressure with a sulphite or some other reducing agent other than sulphurous acid. Carbon monoxide, organic matter, sulphur and carbon are effective reducers. If carbon monoxide is employed the reaction is as follows:

$$CuSO_4 + CO + H_2O = Cu + H_2SO_4 + CO_2.$$

Carbon monoxide is not easily soluble and must be introduced as a gas under pressure. When it is used it is advisable to connect the digester to a vessel filled with lime or other absorbent of carbon monoxide in order to take up the superfluous gas. Water gas, coal gas or other hydrocarbons may be used instead of carbon monoxide. Any organic matter such as glucose or dextrine, organic acids, or sawdust, shavings and wood chips may be employed. The neutral or acid solution of copper sulphate heated with these materials in a closed vessel under pres-

[1] U. S. patent No. 883,961, April 7, 1908.

sure, yields metallic copper, sulphuric acid and carbon dioxide.

When the precious metals are present they may be separated by first treating the copper solution with sulphurous acid at a raised temperature, but under ordinary pressure. By this means the precious metals are alone precipitated in a metallic condition. The solution may then be treated under pressure, to precipitate metallic copper. The copper precipitate thus obtained may be fused or pressed into anodes and electrolytically refined.

The American Institute of Chemical Engineers *

By Charles F. McKenna†

A call for the organization of the chemical engineers has been heard at various times, abroad for 25 years and in this country for over 10 years past. It grew in clearness and volume during recent times, and has culminated in this gathering at Philadelphia. It was not without misgivings and hesitation that the answer to this call was first returned, but we are confident now that the misgivings were unfounded and the hesitation unwarranted.

It has been a subject of frequent remark, of an opinion almost unanimous, among those discussing this scientific society during the past year, that there appears to be enough of such organizations in this country. The followers of almost every conceivable study have some forum, some printed herald to the world, and mode of representation in council. Every active scientist feels the need of joining the groups with whose aims and ideals he is most in sympathy, and among whom he believes he can find the greatest incentive to his own progress; and, since the sciences have become diffused and intimately correlated, the societies which he feels almost compelled to join are both diverse and numerous. The tax upon him soon becomes onerous in consequence. The tax for loyalty in attendance, whether for performing duty or for mere encouragement of numbers, sometimes becomes as severe as the monetary tax for support. Then gradually comes a sensation of surfeit of journals, of meetings and congresses, and papers and reviews, until weariness ensues and a plaintive cry goes up that seems to indicate that the victim has perished in the deep.

It must have been something unusual, therefore, in the conditions surrounding our profession which led so many of its devotees in this county, while impressed with the aforesaid dread of plethora of societies, to say nevertheless that they felt convinced that in this case at least a new society was not only a desirable consummation, not unduly burdensome, but feasible, necessary and unavoidable. Still more: The entire body of adherents was impressed with the glory of the history of our other chemical societies and proud of their achievements. To the claim that these could do everything that could possibly be required to advance the interests of chemical engineering they paid due heed. Yet we find the demand still insistent for the formation of the independent new society. There must be something deep and powerful at work in the minds of chemical engineers to cause this movement; some force that will not down.

Let us examine the cause closely. At once we find that this will be an examination not only into the achievements of chemical engineering of today, but also into the duty to his nation and to mankind that lies before the chemical engineer of the future. Some will say that these are fine words, but that they mean nothing, or at least will lead to nothing. Can this be so when we who ought to know it best are convinced that chemical engineering is today, though unrecognized by the public, performing the greatest feats of economic salvation in the treatment of raw materials for the production of staples and by-products?

Is it not true that the chemical engineer has oftener served the public than the public is aware of, and that he often stands ready to do so without a taker in the market of public life? The President of the United States called together several hundred men, including statesmen, engineers and specialists of the most varied kinds and of the highest standing, to begin the study of the resources of our country, with a view to their conservation. Among the representatives of 40 or more societies and the engineering profession, it was a pleasure to see the names of Doctor Dudley, Professor Bogart and Mr. Ingalls, but nowhere else in the list, and nowhere in the National Conservation Commission since appointed, is there a chemical engineer or a chemist engaged in the treatment of raw material, yet the following are the words of our beloved President in forming the Commission:

"The work of the Commission should be conditioned upon keeping ever in mind the great fact that the life of the Nation depends absolutely on the material resources, which have already made the Nation great. Our object is to conserve the foundations of our prosperity. We intend to use these resources; but to so use them as to conserve them. No effort should be made to limit the wise and proper development and application of these resources; every effort should be made to prevent destruction, to reduce waste, and to distribute the enjoyment of our natural wealth in such a way as to promote the greatest good to the greatest number for the longest time."

These words are almost a good definition of chemical engineering, yet no representative of our profession was called upon, or even thought of. The mayor of a metropolis appoints a committee of experts to advise upon a new building code. There is not a chemist nor a chemical engineer among its members. The president of one of the largest chemical manufacturing companies in the world says in public that he would rather employ the engineer with a smattering of chemistry than the chemist with a smattering of engineering. Instances like this of either ignorance of the existence of a chemical engineer, or of his capabilities, or depreciation of his rightful place in the economy of affairs can be multiplied. I may add one other example in the appointment of a man unfamiliar with technology to the post of superintendent of the assay office in New York, an establishment built up to the best standard of a chemical factory that the world affords by the genius of the man who by age and infirmity was obliged to step down. What society was at hand to protest and demand the appointment of a successor similarly trained, if not similarly gifted.

Can this reference to the education of the chemical engineers of the future be idle when we know that half of the waste of effort in so-called scientific work today is by reason of imperfect preparation of the scholar by which he confounds the means with the end, does not know what the best purpose of his own science is, and in the practice or the teaching of its applications follows a lowly aim with a restricted view? Whence springs the reproach heard against technical education, leading some to call our school laboratories boiler-shops and some to call them brick-yards, if it is not the narrowness of teaching which, in essaying to make useful men and call them scholars, spoils the scholars and dulls the useful men. Whence too springs the reproach to the chemical engineer himself that the public, which he knows he can aid, is not well enough acquainted with him to consider him worthy of being called an adviser of primary importance.

Those who have most closely studied the situation have stated that the chemical engineer must be better recognized, that his talents must be better appreciated and oftener used, that his opportunities must be enlarged, his rewards increased, and above all, his sons and oncoming successors must be better educated. Chemists have been chemists, calling in the hydraulic engineer, the mechanical engineer, or the practical man, as the field of work invited. Is it any wonder that the demand has come for a change and that the chemical engineer wants the world to know that he, with his deep seated knowledge as a chemist of the reactions in-

*Condensation of the initial address at the organization of this society at Philadelphia, June 22, 1908.

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volved, and of the qualities of the raw materials, has also engineering knowledge enough to design his constructions, make his own hydraulic calculations, and knows the qualities and strength of every material which would be put in place under his own eye. That the chemical engineer will oftener be consulted in the future is a certainty, if for no other reason than the fact that in recent years we have seen some conspicuous demonstrations of the disasters caused by the failure to consult him or to yield to his teachings when large commercial undertakings were conceived and carried on in contravention of the warnings of science unheeded by engineers, whose eyes were fixed only on the plan of construction. Mistakes in selection of site, in choice of raw material or fuel, in supply of water, in mechanical equipment or in treatment of material have been so numerous as would constitute almost an indictment of modern engineering if it were not seen that the fault in such cases is individual.

Some have said that ours would be a society of "industrial chemists," and as there are several excellent societies already pledged and actively striving to do something for the "industrial chemist" a waste of effort is involved in our action here. But in that argument lies an error which needs only to be pointed out to bring conviction that we are now in the right position. This error is two-fold, and lies first in the misconception as to what constitutes chemical industry; and secondly, in the belief that outside of a narrow industry the chemical engineer would have no field of action. As a matter of fact there is a vast field for the chemical engineer not covered by mere common acceptance of what is covered as chemicals. We would have the great industry of illuminating-gas manufacture; coking and its by-products, sugar manufacture, paper, corn products, the silicate industries, the numerous industries of oils, fats and waxes, detergents and a great array of textile and paper industries. Moreover, outside of these industries, we have the field of what might be termed water-works chemical-engineering. We have also the field in which the chemical engineer is called when he becomes an adviser to a municipality.

A minor plea for the justification of our institute can be found in the hope of lessening the secrecy which invests much of the good creative work of our best chemical engineers in this country. It is difficult to estimate the proportion of this which is necessary, unavoidable and not unworthy, but as to what can be eliminated we are all agreed that "let there be light" is a command which, if followed, will be for the good of all and the benefit of our country. I am reminded of a circular once sent out by a committee preparing for the annual meeting of one of our chemical societies at Buffalo. It stated that the committee had not been able to obtain permission to "visit chemical works or industrial establishments in the vicinity of Buffalo, but that the use of the city tug for a trip around the harbor had been obtained." Of course, this was many years ago, and the liberality of the great works at Niagara has since fully equaled the brilliancy of the achievements of their founders.

But the noblest aim before us, the one which most amply justifies us before all the world, is our ambition for the enlightenment and ample equipment of our successors; that is, for the improvement of the training of the chemical engineer of the future. How to design a course in chemistry and chemical engineering I leave to other times and other places; this is not the occasion to go deeply into this subject, the mere mention of which conjures up the greatest list of culture, studies, sciences and arts to be mastered, and suggests the greatest variation of opinion among the masters themselves.

I will only ask for fair treatment for the student, and fair treatment for the young graduate who may not know that he has only really just become a student of this practical science. I have often thought that the preceptorial system should be begun in our profession, that the advanced student should be favored with the friendship of a practitioner, and that advice should be given to him as to the utilization of his opportunities and the construction to be put upon his experiences. Encouragement should be given to judicious generalization and a little "shifting in his jobs" should be encouraged within reason. Frequent transplanting is good for the root system of the young tree, but only an expert culturalist should oversee it.

Corundum occurs, in South Australia, in a matrix of schistose rock chiefly of mica. It consists of segregated crystalline lumps, rough hexagonal crystals and small irregular-shaped pieces disseminated through the rock. The formation is said to be extensive and to average in some places from 10 to 25 per cent. corundum.

The Hennig Concentrating Table

A new concentrating table, manufactured for Dr. Charles T. Hennig, 1620 New York avenue, Brooklyn, N. Y., embodies the following features: (1) the riffles consist of thin strips of sheet lead having a wavy form, accentuated at the head of the table and gradually straightening until, at the discharge end, they are almost straight. The curves are easily made by forming the riffles on a wooden pattern; (2) the feed trough, which extends the entire length of the table, is divided into a convenient number of compartments, separated by wooden gates of varying hights; each compartment has a number of small holes bored in the wall nearest the table surface, the level of the holes in one compartment being slightly higher than the level of the next set; (3) the table is mounted on a wooden frame by means of four ball-and-socket joints which impart a rocking motion in addition to the usual end-bump motion.

As the sands travel along the table their motion conforms to the wavy shape of the riffles; for this reason and because of the rocking motion of the table, the sands are in constant agitation. The feed trough is so constructed that the sands are classified before they flow upon the table. In the first compartment the level of the water is higher than in the next and the lighter grains are forced up and flow through the first row of holes. The heaviest grains pass under the gate together with the grains too heavy to pass out through the holes in the first compartment. In the second section of the trough a further classification is made and this operation is continued until finally only the heaviest particles remain and these are fed upon the lower or concentrating end of the table and flow almost straight across. By classifying the sands in this manner the burden on the table is evenly distributed and the bulk of the concentrate has only a comparatively short distance to travel. The ball-and-socket attachment imparts a motion similar to the motion of panning.

HENNIG CONCENTRATING TABLE

Mining in Flat Coal Seams under Heavy Cover

A Technical Consideration of Costs and Details of Operation. Economical Arrangement of Mule and Motor Haulage Systems

BY AUDLEY H. STOW*

One of the interesting subjects pertaining to coal mining is that of the mine car. The variations in detail of cars for underground use are too numerous to attempt even casual mention; perhaps the more important classification is that of weight, compared with hight of the coal, or rather compared with the hight of the mule that has to pull the car.

There seems to be, however, a tendency toward replacing the mule with the gathering motor; weight would then be of much less interest, admitting of the most substantial construction, with consequent lessened cost of repairs. Certainly also there would be less derailments or wrecks with heavy, than with light cars, although the former, when once derailed, are also put on with more difficulty.

Cost of Repairs to Mine Cars

If more data were available as to the cost of repairs for the different types of cars, it would not be difficult to decide approximately on the general outline of car equipment. Assuming that it requires two carpenters, one at $2.50 and one at $2, or $4.50 per day to keep in good repair 100 mine cars of light construction, costing, say, $75 each, the cost of repairs per year of 300 working days will total $1350; $50 additional per car would give a really well built car, and would amount to $5000 additional for the 100 cars. Allowing 6 per cent. interest and and 6 per cent. for depreciation (considering 12 years average life; the shorter length of life of the wooden portion being charged off against the longer life of the iron cars), would amount to $600 on the $5000 additional cost, leaving $750 saved per year by building the $125 car, provided there were no repairs on the $125 car. Unless it is the straight steel mine car, there are few cars built that will not cost at least $100 to $250 per year per 100 cars for repairs; at $250 per year, the net profit on an investment of $5000 would be $500, or 10 per cent.; at $750 saved per year, the profit would be 15 per cent. In addition to a seemingly clear net profit over and above all charges of, say, 10 to 15 per cent., there is also a material profit in the reduced number of expensive wrecks, with a substantially built mine car over and above those with the light, cheap car.

The general character of the haulage, whether straight mule, mule and motor, or gathering and haulage motor, as well as the type of car, will materially alter the figures given; in some instances, it has appeared clear that slight improvements could be made at an almost nominal increase in cost, that would materially reduce cost of repairs, as well as of wrecks. With mule haulage, if due attention is paid to the condition of the stock, there should be a fairly definite limit to the weight of the car.

One type of car seldom seen and that deserved a better fate, is the vehicle with wooden bottom, sheet-iron sides and wooden top side board; the additional cost is little, the weight small and the capacity considerable. The mine car with one loose and one tight wheel on each axle seems to merit more general use; with one loose and one tight wheel, the rolling friction on the short curves usually found on the mule hauls is no more than with both wheels loose, while the wheels and axles may be removed without removing the boxings, the wear being thrown on an inexpensive casting easily removed, instead of on the wheels. The common run of loose wheels would seem particularly defective in the length of the bearing on the axle; there seems to be some reason at least for inferring that the real merit of one form of patent loose wheel that has become popular in some sections, is rather the length of the bearing on the axle. For slow mule haulage, the common length of axle bearings is fairly well proportioned, but for fast haulage, the side thrust on the axle bearings on taking curves is heavy, particularly with high heavy cars. With both wheels loose, there results quick cutting away of the edges of the bearings, allowing the wheels to creel over; once the cutting away of the edge of the axle bearing becomes appreciable, the deterioration of the wheel becomes rapid, the car getting badly out of gage, the resulting wrecks becoming numerous. With one loose and one tight wheel, the movement of the loose wheel on the axle, on going around curves, is only that due to the difference in the length of the inside and outside rails; while the side thrust on going around curves is just the same with one loose and one tight wheel as with both wheels loose, the movement on the axle is so much less that the resulting cutting action, for the same length of bearing, becomes an almost negligible quantity. For long hauls without stops, the self-oiling wheel becomes ineffective owing to the oil being kept away from the axle bearing, due to centrifugal action; with one loose and one tight wheel, practically no lubrication of the loose wheel is required on tangents, and almost none on curves; for long, fast hauls, the points in favor of both wheels tight on the axle would seem to be, largely at least, along the same lines as in the case of one loose and one tight wheel.

The question of latches and brakes would appear to be rather one of personal preference; there are a number of forms of each that seem to answer well, if kept in repair. The fixed end gate, were it not for the expensive and complicated dump required, would seem all that could be desired, the usual form of hinged-end gate, especially when the car gets old and badly spread, being a first rate distributor of slack and fine coal, almost equal to screen bars; center bumpers, while unquestionably preferable for mechanical haulage, add considerable to the weight.

Mine Track

The size of motor rail used by different companies under similar conditions, varies considerable; while unquestionably there is something saved on interest charges by using the lightest weight rail admissible for the size of motor, at the same time it is a serious question whether a heavier rail is not more economical in the long run. Motor haulways cannot always be kept surfaced up, drained, etc., as on railroads; the heavier rail will stand bad surfacing, wet road bed, and occasional bad ties far better than the lighter rail, and will often pay for the difference many times over, more particularly in the reduced number of wrecks.

The practice of tearing room track out of places that have to stand any length of time seems to be general and is clearly justifiable, although it is occasionally argued that it is economy to leave track in rooms in order to avoid the expense of tearing out and relaying again for the pillar work.

On the basis of one track man at $2.25 and a helper at $1.75 laying 150 ft. of track per day, the track will cost $2.65 per 100 ft., or $13.25 per room of 500 feet.

COST OF LAYING TRACK

500 ft. of track, labor	$13.25
500 ft. of track, ties 2-ft. centers @ 5½c.	13.75
500 ft. of 25-lb. rail, 4 15-100 tons @ $30	124.50
Spikes, etc., say	$1.50
	$153.00

Considering the common interest at 6 per cent. and 6 per cent. for depreciation, based on an average life of 12 years, these two items amount to $18.36 on an expenditure of $153. Estimating in this way, the loss from leaving track in rooms

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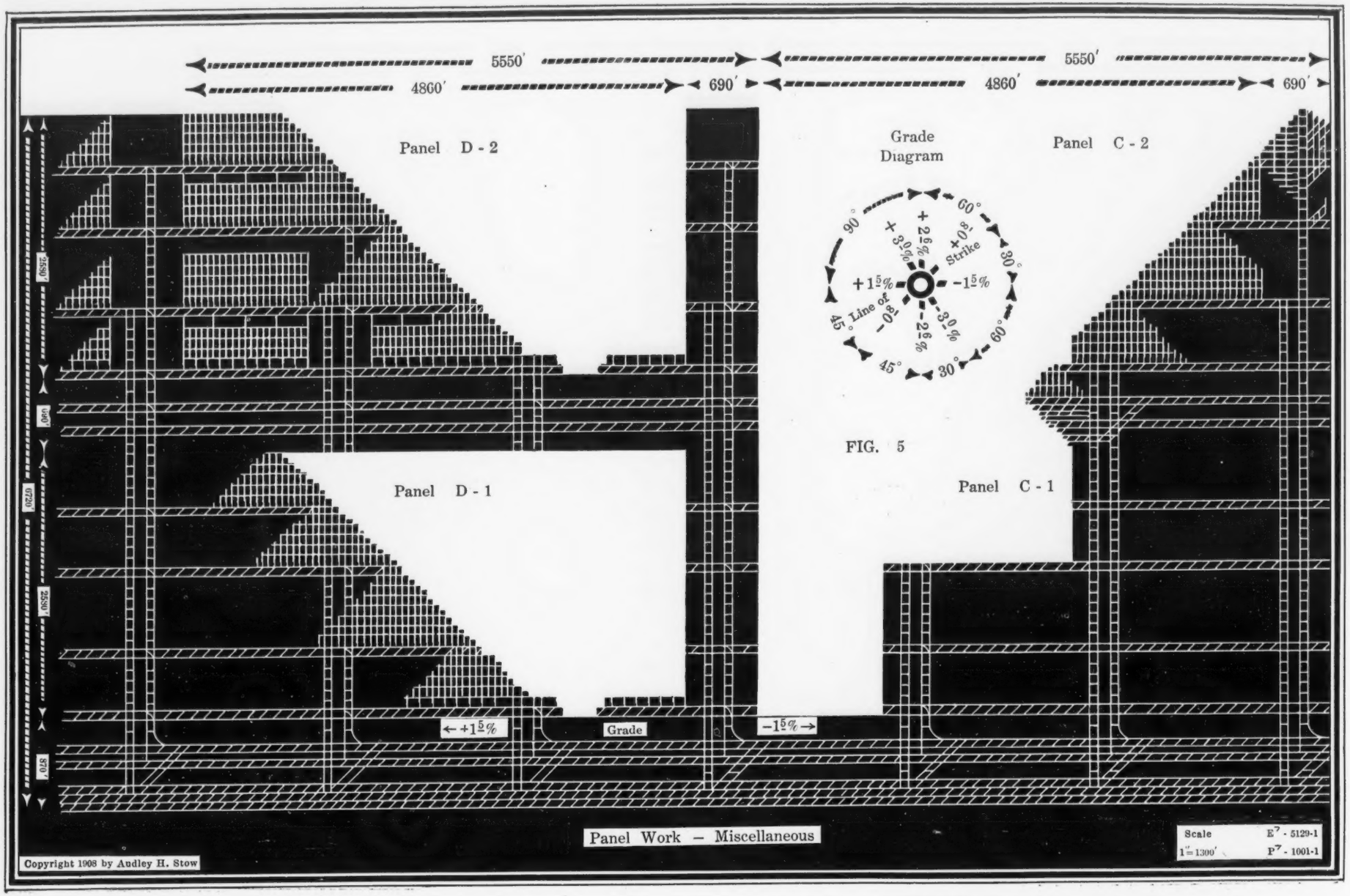

GENERAL PLAN FOR DEVELOPING A FLAT COAL SEAM HAVING HEAVY COVER

is $18.36 per year, to which should be added, say, $3 per year depreciation in ties, making a total of about $21.

Figuring the cost of laying 500 ft. of track at $13 and tearing the same out at cost of $7 makes a total of $20 for tearing out and relaying for the pillar work; however, by tearing out the track, as soon as the room is driven up, it is possible to use the ties twice, making a saving of, say $7, so that the net cost of tearing out and relaying compared with leaving track in, is only $13. This means a loss of $8, the first year track is left in the rooms, and $21 each year thereafter, on the basis of a 12-year life of rail. The variable life of ties of different kinds of wood will change the figures somewhat, as will a different length of life for the rail; 16-lb. rail in place of 25-lb. steel, will reduce the interest charges materially, but will about balance the costs and interest charges at the end of the first year, making the second year a dead loss, not to mention the chance of losing the track from falls too heavy to clean up. If panels are, say, 1200x1200 ft., and consist of two entries and their rooms, the entries being 75-ft. centers, this arrangement will make the rooms 525 ft. center to center; 500 ft. of track will ordinarily be sufficient to drive the rooms up, until they hole into the air course above.

Intimately connected with track is the question of the average length of life of the rail; motor rail usually reaches an old age in hard service, while room rail does not last as long, although a few such rails seem to have been sentenced to life imprisonment, in old abandoned workings. Motor rail is usually of much heavier section in proportion to the maximum weight carried, than in railroad practice, although the few curves are commonly taken at slow speeds so that the actual wear seems less; extensive development work may mean considerable capital tied up in motor rail.

Assuming that the life of a rail is the interval of time between the date on which it reaches the drift mouth and the date on which it is caught by a pillar fall, this then becomes a separate problem not only for each mine, but varying from day to day, although for any given mine crew, it is possible a reasonably constant figure can be obtained, if averaged over suitable periods. This question of the length of life of room rail has been found a somewhat difficult one to determine, although a question that means considerable money in the run of a year; while inspections have been found a useful check on the careless loss of rail, it hardly seems practicable to attempt in this way to determine the exact amount, which would require practically one man's time on the pillars alone.

An exact inventory means no small amount of work, both field and office, for properties of considerable size, although their expense would seem to be justified, at least annually, if not quarterly, where there is reason for believing that there is a considerable loss of rail going on. In the absence of exact inventories, it would seem practicable to make rough approximations that might serve as useful checks; the amount of room rail required should bear some fairly definite relation to the output, provided there is no loss on the pillars.

A Practical Example

A room 500 ft. long, 20 ft. wide and working a 6-ft. seam, together with five crosscuts or breakthroughs 40 ft. in depth each, contains 3100 tons of coal; the straight room contains but 2200 tons. Three two-ton cars one day and four the next, or 7 tons average per day for 300 days, will drive the room out in practically a year. The remaining pillar, practically 400x40 ft., will contain 3550 tons, which on an 85-per cent. recovery will yield 3000 tons; the pillars should easily average 10 tons per day per pillar; the 500 ft. of track necessary to start the pillar thus turning out the same number of tons per year as the room track; the quick loading on the pillars is offset by the additional tonnage from the crosscuts in the case of the rooms. On the assumed basis, 3000 tons per year from 500 ft. of track, considering pillars as well as rooms, 300,000 tons per year will require 50,000 ft. of room track, or 415 tons of 25-lb. rail. If we allow 20 per cent. for idle track and stock on hand, 500 tons would be the amount required for the output indicated; at the same time, only about 420 tons are in actual service, 210 in the rooms and 210 in the pillars; if 70 tons have been requisitioned for the year, it would appear that one-third of the rail in actual service on the pillars had probably been lost; if 35 tons have been requisitioned, the loss would appear to be one-sixth the pillar rail or one-twelfth the total rail in service, equivalent to a 12-year life of rail. Suitable allowance would have to be made for reserves of rail that could be proved. An unusual proportion of idle places would be a clear credit, and in the case of irregular outputs, the amount of rail required would be that for the maximum output; a gradually increasing output would make it necessary to charge requisitions in part to this account. While this method may involve many possible corrections, the requisitions for rail would seem to be the key to the loss of rail on pillars. A reduction in the number of tons per place means a serious increase in the amount of capital tied up in rail, and in depreciation in ties; in the instance taken, an average output of only five tons per place, due to absences and similar causes, would mean something like 1000 tons of room rail and 50,000 ties necessary. Interest at 6 per cent. on the rail, would amount to say $2000, and the depreciation in ties, at say 1¼c. each, to $600 a year.

Mine foremen have usually been found creditably anxious to keep down expenses, but they do not generally appreciate the extent to which the loss of rail on pillars or in old abandoned workings, affects their working costs; 500 ft. of 25-lb. track, rail and ½ the life of ties, at present prices delivered, may be estimated at about $150; a loss of only one-fifth the pillar rail would amount to $30, or 1c. per ton for the pillar coal, or ½c. per ton for the entire output. One-fifth of the pillar rail is a reasonable enough loss, depending upon the top; 25-lb. rail is seldom seen on pillars, although the saving in using 16-lb. rail is in part offset by the higher price; 16-lb. rail, for the same proportional loss, would amount to say ¾c. per ton for the pillar coal, or ⅜c. per ton for the entire output. Any considerable amount of 16-lb. rail abandoned in old workings would easily bring the loss up to ½c. per ton for the entire output; larger losses of rail than one-fifth will increase the cost per ton proportionately.

Owing to the custom of keeping the track pulled out of an air course and the crosscuts, as fast as the advance of the entry admits such practice, 100 ft. of room track used in driving the headings, may be said to turn out the coal from 300 ft. of narrow work, practically equivalent to room work. Where the roof admits of crosscuts being driven room width with perfect safety, entry track may be said to turn out more coal than either room or pillar track.

Thoroughly practical managers and superintendents know well enough when requisitions for rail become excessive; it is necessary to know, however, not merely what amount each mine foreman has used, but what the actual bona fide minimum requirements are; neither does so many tons a year, on the face of it, give the average length of life of room rail, which is in part the object of this analysis.

Motor Haulage

Gross errors in motor haulage, such as having grades against the loads when the haulway might have been so located that the grades would have been in favor of the loads, are seldom, although occasionally seen; the practice, however, seems to vary considerably where motor hauls cross heavy local swags or dips, particularly in low coal where straight through grades would necessitate heavy top shooting. Common interest at 6 per cent., and 4 per cent. added for depreciation, with, say, a 20-year life, on the amount of money necessary to shoot top and raise track, may be considered as the fixed annual charge against the proposed improvement. In the case of a swag or dip 1000 ft. long, 8 ft. maximum depth, we may estimate the amount of top necessary to be shot at, say, 1500 cu.yd., which at 50c. a yard, depending upon the nature of the top, would amount to $750; surfacing track and gobbing slate in excess of that needed to raise the track, should not make

the total cost over $1000. If the track has been in use several years, new ties would doubtless be put in, but should be charged to track maintenance. The yearly charge against the proposed improvement would be 10 per cent. on $1000, or $100. The increased cost of car repairs, depending somewhat on the car, and in part on the motor runner, would in many instances, pay a considerable part of the yearly charge.

If we figure the output at 300 cars of 3 tons gross weight (motor reduced to cars, included) per day, vertical lift 6 ft. (2 ft. having been deducted for the speed gained going down hill), we have 327 total horse-power required per day, equivalent to, say, ½ h.p. per year on a 10-hour basis, or, say, 1/5 h.p. per year on a 24-hour basis, costing probably in the neighborhood of $10 to $12 per year; this figure, however, becomes more interesting as the output is increased.

Where the grades are generally irregular, and it is impracticable to make them otherwise, the increased cost of motor cannot be properly charged to any one hill, and thus becomes a small item; where the grades are generally irregular and steep, rope haulage, either tail rope or endless, has several points of advantage, even where the grades are not past motor limits, more particularly in the better control of trips, and in the prevention of reckless speeds.

Where the dips or swags are on local hauls not likely to last more than a year or two, the case is quite different; it is then a question whether the various items heretofore spoken of as offsets against the yearly charge, will amount to as much as the entire first cost instead of the interest on same; even in this case, however, it is well to consider the question carefully; anyone who has seen trips turned loose by reckless motor runners on the down grades in order to climb the hill on the other side, cannot but admit that the wear and tear is considerable. The cost of wrecks does not always seem to be thoroughly appreciated or properly figured. Such damage to track, cars and motor should be added to the other items and appear on the cost sheets.

Mule Haulage

The panels as worked in many flat seams are 1200x1200 ft. and composed of two entries; the extreme limits of the mule hauls within the panel limits being 1800 ft., or an average of, say, 900 ft. one way per entry, where the panel is robbed retreating. It can be said that 900 ft. is near enough, the average length of the mule haul where the motor is shoved up to the partings within the panel, as soon as this can be conveniently done. While it may not seem far from the panel partings to the cross-entry partings, the former cannot be placed much closer than, say, 600 ft. for partings 400 ft. long, point to point of point of switch. If the cross-entry parting is retained in service until the heading within the panel under discussion is half driven up, this will make a total increase in the average length of haul of 300 ft., or an increase in the average length of haul of one-third.

The chances of killing or crippling mules would be just one-third more on the longer than on the shorter haul, not to mention the difference in the condition of the mule or mules at the end of a year's steady service.

It would seem fair to assume in a general way, that the number of mules killed is in direct proportion to the number of miles traveled; a one-third reduction in the number of mules killed in the run of a year, would be no small item for a large operation. It does not seem fair to charge up against this the cost of moving up the parting, as the latter has to be moved up off the cross-entry for the panel-pillar work, even if it is not thought necessary to do so for room work. Reducing the mule haul at the expense of drivers' wages, however, is not economy, compared with which the cost of maintenance and depreciation of the mule is a small item, although there is clear economy in decreasing the mule haul, where other costs are not increased thereby.

Drivers are to Blame

Figuring one 1200x1200-ft. panel of 6-ft. coal, as yielding, say, 250,000 tons, or 125,000 two-ton trips of 900 ft. each way will make 225,000,000 ft., or, say, 40,000 mule miles, one mule one mile one way; the 1200-ft. haul will make at least 50,000 mule miles, or 10,000 mule miles unnecessary travel.

Mule haulage is perhaps the next most important item in the cost of coal after digging and loading, the driver's wages being the most important item in the cost of the mule haul. Some progress seems to have been made in getting after the driver, although it is not at all uncommon to see him hitting the same old pace, sometimes in direct proportion to the number of apples, the amount of grub and tobacco, etc., given him by the miners, with oil and cash sometimes thrown in. The driver should be made to turn in the number of cars hauled, while in some sections the miners see that he keeps moving; at the same time, poor service from just a few drivers means a considerable additional cost, not merely in haulage, but in loss of output as well as loss of wages to the miner. It would not be unreasonable to require the driver to carry checks, say, of a special form, possibly lettered instead of numbered to be placed in the empty car when delivered to the miner; a bonus for all cars over a certain number might be a really good thing, and would necessitate the introduction of the driver's check.

Loss of Coal in Mining

Were the same methods applied to coal mining, as to most other lines of business today, managers would want to know the total number of tons of coal originally in the property, which in many cases can be determined with considerable exactness; it would also be asked, how many tons of coal are exhausted each year and whether all of this was in stumps necessarily left to protect the miner on the retreat; whether a considerable proportion was not on pillars too badly gobbed to be recovered, and whether suitable and timely timbering would not have prevented the falls until the pillars in question could have been recovered.

A pillar 40 ft. wide by 100 ft. long, with 7 ft. of coal, contains slightly over 1000 tons, and on an 85-per cent. recovery, should yield, say, 850 tons; two rows of props with 6-ft. centers in each row, equivalent to 3-ft. centers for one row, and costing say 25c. each in place, would amount to $8.50, or 1c. per ton. When a pillar is once cut off by falls, it may cost many times this amount to clean up the slate, even if it is not impossible to recover the pillar on the score of safety. Were it merely a question of losing an occasional small pillar, this would no doubt be cheaper than to add 1c. to the cost of all the pillar coal; but once a mine has been opened a sufficient length of time to develop the special peculiarities of the top to be met, it should be possible to decide whether the absence of all timbering is likely to result in only small local losses, or in a considerable percentage of loss. It should also be possible to determine whether the expense of such timbering as might hold the top would be justifiable. The mine foreman should be given a definite limit in cents per ton of coal or in fractions of a cent, as the case may be. He should also be required to clean up all falls under the limit. It is a comparatively easy matter at each mine to determine closely the average cost per cubic yard for cleaning up slate. Pillars can often be slabbed or split, thus avoiding the necessity of cleaning up such falls. Where considerable timbering would be required, a material economy may be effected by timbering every other room only, and then stumping right and left.

Mine foremen are too often judged solely by the cost of coal in cents per ton at the end of the year, and no questions are asked as to any of the various methods by which apparent costs may be kept down; a seemingly higher cost may in reality be a far more economical management.

Losses Resulting from Carelessness

While the percentages of coal recovered from the pillars by some of our more progressive companies are unquestionably high and promise to become even higher, in some of the newer sections, more particularly, there seems to be a sort of "there's plenty more where that came

from" spirit abroad; many of our mining properties are so large, and have often been purchased almost for a song. Careless losses of coal on pillars is too often looked upon by many, stockholders sometimes, as falling upon another generation or two, whereas looked squarely in the face, it seems clearly in many instances at least, a direct present loss coming out of current dividends; the output of many companies—and it is needless to say that all dividends are dependent upon the output—is limited by the rate the headings can be advanced. Every 100 ft., or 1000 ft. that the headings are driven should mean so many tons of coal on board car, or so many dollars in dividends. If through careless robbing, only 60 per cent. is recovered when 80 per cent. might have been obtained, the loss may be said to be one-eighth of the entire output for the year, counting the pillar coal as one-half the output. The dividends are affected even more seriously than the output, the cost per ton usually going up as the production goes down. Where entries have been driven ahead of all possible future needs—which, however, is seldom the case—the loss is the shortened life of the property; in most instances, even with well-driven entries, the time comes when cars and men are plentiful, the output depending solely upon the number of working places available; then the bill for carelessness and ignorance becomes a sight draft, and must be honored.

In instances where the pillar work is not particularly evident on the surface, it is assumed by some that the overlying strata have choked instead of breaking clear to the surface; what is meant by a clear break is not necessarily more than a mere crack, with possibly not over an inch or two of a drop; this, however, should be sufficient to relieve the pressure, although not readily noticeable in rough countries, or in sections where the soil is deep. That the pillar work is not evident on the surface is in some sections, rather an evidence of poor recovery of the pillars.

A 1200x1200-ft. panel contains something over 30 acres; on the supposition that the overlying strata choke instead of breaking clear, say to an extent equivalent to 300 ft., the total cover being supposed to be 700 ft., there would still be over 30 acres with 400 ft. of cover, equivalent to, say, 20 acres of 700-ft. cover, to be supported by the surrounding coal, which hardly seems a tenable theory. In perhaps the majority of instances the choking quite likely amounts to more than half the thickness of the coal; in the case of 4-ft. coal with 700 ft. of cover, it is likely the choking will, in many instances, amount to, say, 3 ft. for 300 ft. of strata leaving the upper 400 ft. to drop only one foot, and where the pillar work has been poor, possibly a less distance. That the weight could be relieved without a clear break of the entire 700 ft. does not seem possible except in the case of strata sufficiently flexible to bend the requisite amount without breaking; it often happens that the weight is clearly off the coal, while no evidence of a break is seen on the surface, particularly in low coal.

It may be argued that the large number of barrier pillars shown in Fig. 4, May 2, issue of the ENGINEERING AND MINING JOURNAL, page 894, will result in increased loss of coal; while this is correct to some extent, the amount would seem negligible, compared with the heavy losses usually resulting from large areas of open work, with anything but an A No. 1 top. With even good top, slight irregularities in long break lines may easily result in heavier losses than should result from the number of barriers shown in Fig. 4, which are only essential to maximum output, from a given width; the full number is seldom if ever required, with the usual shortage in railroad cars, provided the entries are always pushed.

The proportion of barriers shown in Fig. 4, can be largely reduced by throwing the secondary panels—designated by numbers in Fig. 4—into primary panels, as in Fig. 5, the primary panels being designated by letters. On account of the size of the primary panels shown, and consequently the length of time necessary to drive them up, say, 6 to 8 years, it will ordinarily be necessary to rob advancing, instead of waiting until the primary panels are driven up, and then rob retreating, which would be almost ideal, could it be done. This would be practically the same scheme as in Fig. 4, on a larger scale, provided the entries were driven blank, for otherwise the amount of open work would be enormous. Much the same result can be obtained by pushing the entries as fast as possible, and robbing as few of the secondary panels as circumstances permit, as illustrated in Fig. 5, panel C-1. A portion of panel C-2 is also supposed to have been reserved for emergency output, but the requirements of the market have made it necessary to draw on the panel C-2 reserve, as well as to rob panels D-1 and D-2 advancing. If the breakline shown in panel C-2 can be carried continuously in the same direction across panel C-1, all barriers will be recovered on the favorable grades of the rise coal; the logical deduction from this is, never let your entries stand, drive them through dull times and panics (if finances permit). Require mine foremen to show up their entry driving, footed up month by month throughout the year, for this is just as essential as their cost sheets. Fig. 4 shows the maximum output for the minimum area of open work, requiring, it need hardly be said, the pillar work following at the same rate of advance as the entry work. Increasing the rate of advance of the entry work or decreasing the rate of following of the pillar work makes possible a reduction in the proportion of the barrier pillars to be robbed as such.

With work laid off as in Fig. 4, it can be readily thrown into the forms illustrated in panels D-1 and D-2; while panel D-1 may seem preferable at first sight to panel D-2, and in fact is as far as open work is concerned, panel D-1 may be seriously criticized as far as haulage is considered. The adverse grades against the loads on the mule hauls in the case of motor haulage on the cross-entries can be "swapped" for long relay mule hauls over constantly shifting routes; the grades in this case, however, being in favor of the loads, either solution may be the price paid for recovering the barriers shown in Fig. 4 on the usual favorable grades of the rise coal; the large heading barrier between the primary panels, as well as the cross-entry barriers between the primary panels, have still to be recovered, as well as the corresponding barriers in Fig. 4.

The long mule haul referred to in connection with Fig. 2, p. 505 of the ENGINEERING AND MINING JOURNAL for March 7, 1908, should be more clearly evident in panel D-1, Fig. 5. For the dimensions shown, the extreme mule haul may be said to be 5300 to 5500 ft., or an average one way of, say, half a mile, which should call for at least one relay, if not two. Motor hauls can be arranged up the cross-entries, but involve, as should be evident from the figure, adverse grades against the loads on the mule hauls; the extra mules necessary for the adverse grades should at least furnish the relay mules on the straight mule haulage, so that the advantage of taking the motor off the main entry is not very evident. Panel D-2 has the advantage over panel D-1 on the score of haulage, in that say, half the coal, that is the room and entry coal, has been obtained on good grades with short mule hauls. Panel D-2, however, is open to the same criticism on the score of the large amount of open work as in Fig. 2, being in fact almost identically the same.

The number of fatal coal mine accidents in England during 1907 was 1239, an increase of 97 over the previous year. The deaths from falls of roof or side numbered 572, an increase of 25 over those of 1906. In one district five deaths occurred from falls of roof or side for every fatality due to an explosion of gas or dust.

A mixture which gives good results in preventing the rusting of machinery is one ounce of camphor dissolved in one pound of melted lard. Skim off the impurities and add black lead to give an iron color. Clean the machinery carefully and apply the mixture, which may be left on indefinitely, or if wiped off in 24 hours will prevent rust for some time. Polish the metal with a soft cloth after removing the mixture.

The American Chemical Society

The thirty-eighth general meeting of the American Chemical Society was held in New Haven, Conn., June 29 to July 2, and was one of the most successful summer meetings ever held by the Society. Over 250 members were present and 174 papers were presented. The large number of papers made it necessary to hold more sectional meetings than usual and the Society met in six sections for the presentation of papers.

The Society met June 29 in the lecture rooms of the Sheffield Scientific School and the following nine papers were presented in general session before all the members: "Official Inspection of Commodities," by A. L. Winton, chairman of the agricultural and food section. "The Increasing Importance of the Rarer Elements," by P. E. Browning, chairman of the inorganic section. "The Analyst, the Chemist and the Chemical Engineer," by Wm. D. Richardson, chairman of the industrial section. "A Discussion of Some of the Methods Used in Determining the Structure of Organic Compounds," by Wm. McPherson, chairman of the organic section. "Our Present Knowledge of Plant Proteins," by T. B. Osborne, chairman of the biological and sanitary chemistry section. "Some Applications of Physical Chemistry," by Frank K. Cameron, chairman of the physical chemistry section. "Chemical Publications in America in Relation to Chemical Industry," by W. A. Noyes. "The Electrolytic Theory of the Corrosion of Iron as Applied to the Protection of Steam Boilers," by W. H. Walker. "The Research Chemist," by W. R. Whitney.

The physical section had an unusually attractive program containing some 45 papers, and greetings were received from Arrhenius, Emil Fischer, Roscoe, Ramsay, van't Hoff, Julius Thomsen, Lunge and von Baeyer. Papers were sent for the meeting by Svante Arrhenius on "Agglutination and Coagulation" and two papers by Emil Fischer on "Polypeptides" and "Micropolarization."

On Wednesday afternoon, July 1, an excursion to Ansonia was made by the visiting chemists for the purpose of visiting the works of the Ansonia Brass and Copper Company and the Coe Brass Manufacturing Company. On the evening of the same day the members met on the East Shore for a social outing and dinner.

The organization of the Division of Industrial Chemists and Chemical Engineers was a feature of the meeting and the following officers were elected: Chairman, A. D. Little; vice-chairman, A. H. Low; secretary, B. T. B. Hyde; executive committee, Wm. H. Walker, Wm. Brady, J. D. Pennock, W. C. Ebaugh, F. B. Carpenter. Twenty-eight important papers were presented before the division and marked enthusiasm was shown. A movement is also on foot for organizing the food chemists, the general and physical chemists and the fertilizer chemists.

The rapid growth of the society under the impetus of the organization of chemists into special groups and the continually improving quality of its journals was noted by all, 700 new members having been added in the last eight months.

Matters of decided importance were brought before the council and acted upon. A new section of the society was established with headquarters at Louisville, Ky. It was decided that the winter meeting should be held in Baltimore in affiliation with the American Association for the Advancement of Science, and that the summer meeting for 1909 should be held in San Francisco.

The Society having been represented by its president in the recent conference in Washington, it was voted that a standing committee on the conservation of our natural resources be established and that the American Chemical Society should attempt to point out how chemists could assist this movement.

W. D. Richardson was elected editor-in-chief of the new *Journal of Industrial and Engineering Chemistry* and the following were elected as associate editors: Henry M. Howe, metallurgy of iron and steel; A. H. Low, metallurgy of gold, silver and lead; Geo. C. Stone, copper, zinc and other non-ferrous metallurgy; Willis R. Whitney, applied electrochemistry; F. W. Lovejoy, photochemistry; A. E. Leach, foods; L. P. Kinnicutt, water, sewage and sanitation; F. B. Carpenter, fertilizers and soils; Robert Wahl, fermented and distilled liquors; Virgil Coblentz, pharmaceutical chemistry; T. J. Parker, heavy chemicals; J. B. F. Herreshoff, sulphuric acid; Karl Langenbeck, ceramics; G. E. Barton, glass; Ernest B. McCready, cement, mortar and building materials; Clifford Richardson, asphalt and petroleum; A. D. Little, cellulose and paper; Francis I. du Pont, explosives; E. G. Bailey, fuels; J. D. Pennock, destructive distillation; John Alden, textiles, bleaching and dyeing; P. C. McIlhiney, pigments, rosins and varnish; W. C. Geer, rubber; Ernest Twitchell, fats, waxes and soaps; W. D. Horne, sugar and starch; W. K. Alsop, leather; G. R. Underwood, glue; Edward Mallinckrodt, fine chemicals; M. C. Whitaker, gas; W. F. Hillebrand, pure and analytical chemistry; W. H. Walker, engineering chemistry; Wm. Campbell, metallography; W. C. Ebaugh and F. H. Thorp, miscellaneous industrial chemistry.

The committee on the Qualifications of Chemists made a preliminary report on the establishment of an Institute of Chemistry, which has been under consideration for the past two years, and it was decided on account of its great importance to refer this matter again to a representative committee of 15 for further consideration and report back to the council.

The committee appointed to consider the training and education of chemists and chemical engineers made its report and as a result a movement is under way to establish a section or division of chemical education within the Society, which shall especially appeal to teachers and shall study more particularly the existing standards and methods of instruction throughout the country and the possibility of improving same.

The Society adjourned July 2 after one of the best meetings in its history.

Annual Reports of the Coeur d'Alene Mining Companies

According to the annual statements of the larger mining companies operating in the Coeur d'Alene district, to the county assessor, 1,366,076 tons of lead-silver ore were shipped from the district during the year 1907, yielding a gross profit of $14,367,418, and a net profit of $4,810,522. The profits of nearly all the big companies were less than those of 1906, due chiefly to the depression in the metal markets. The statement of the Federal Mining and Smelting Company shows a reduction in profits of more than $1,000,000, as compared with the records of 1906. The more important figures of the various companies are included in the accompanying table.

SUMMARY OF REPORTS OF THE COEUR D'ALENE MINES FOR 1907.

	Tons Mined.	Gross Value.	Mining Costs.	Transportation, Reduction and Sale.	Improvements.	Net Profit.	Net Loss.
Morning	297,500	$1,497,325	$ 680,132	$ 512,482	$ 70,835	$ 233,876	.....
Standard & Mammoth	287,300	3,193,320	1,085,131	865,828	38,345	1,204,016	.....
Tiger	51,800	252,784	252,625	73,669	32,518	.....	$106,028
Last Chance	163,600	1,242,048	569,824	387,009	28,372	256,843	.....
Bunker Hill & Sullivan	312,800	4,180,210	666,803	1,463,200	183,724	1,866,483	.....
Hercules	20,466	1,615,684	178,038	329,093	343,392	765,161	.....
Hecla	117,430	1,244,685	440,282	333,349	33,864	437,190	.....
Frisco	55,846	493,664	229,564	230,332	61,300	.....	27,532
Gold Hunter	49,453	172,617	141,712	43,000	63,439	.....	75,534
Tamarack & Chesapeake	277	10,349	16,574	2,747	15,858	.....	24,830
Success	7,262	211,884	54,132	81,168	35,781	40,803	.....
Pittsburg Lead	2,342	252,851	72,966	73,796	21,440	84,649	.....
Snowstorm	95,435	1,396,258	216,393	569,684	155,892	454,289	.....
Stanley	122,979	.....	.....	.....	10,000	3,533	.....

According to the *Mining Journal*, July 4, 1908, the production of asbestos in the Urals in 1907 was 571,194 poods.

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Technical Degrees

This is an age of specialization; also it is an age in which the desire for titles appears to be increasing. The University of Arkansas seems to have gone to the limit in creating a new course of instruction for the completion of which the degree of "Bachelor of Science in Cement Engineering" is to be conferred. However, it is to be congratulated upon its moderation in refraining to call its new degree "cement engineer."

It is a pity that all of our technical schools and other institutions of learning will not confine themselves to simple degrees, such as bachelor of science, bachelor of philosophy, bachelor of engineering, and the corresponding degrees of master and doctor. Degrees are of only slight significance, anyway; they indicate nothing more than that the recipient has fulfilled certain requirements in a course of instruction. With the possible exception the doctorate, degrees have no commercial value.

The practice of the schools in giving vocational degrees, i.e., degrees corresponding with the names of occupations, such as mining engineer, mechanical engineer, etc., is to be deprecated. For one thing, the young man whom the school dubs "mining engineer" is usually not a mining engineer, but merely a prospective mining engineer; on the other hand, the mining engineer who has not had the advantage of graduation from a school, has a perfect right to call himself a mining engineer, and to abbreviate his vocational title by "Min. Eng." "M. E.," or in any other way that he pleases. Of course, the use of such an abbreviation as the latter is to be regretted, inasmuch as nine times out of ten it is intended to convey a false impression. Well known engineers do not need to put letters after their names; nor do they need to write themselves down as engineers of one kind or another.

On the other hand, it is a rather unfortunate young graduate who possesses the degree of C. E., which may stand for civil engineer, chemical engineer, or cement engineer; or he who has the degree of M. E., which may stand for mining engineer, mechanical engineer, mill engineer, marine engineer, metallurgical engineer, and perhaps some other kind of engineer. He is unfortunate because he possesses only the right to letters, which many may adopt upon their own volition, and the letters have not even the advantage of distinctiveness. He would be better off if he had the older and more significant degree of bachelor of science (or engineering). The administrations of the colleges ought to think about this.

However, to revert to our subject. Once there were but two kinds of engineering, viz., military and civil. The latter split up naturally into the great branches such as mining, mechanical, electrical, and the special kind of constructional engineering which we now know as civil engineering proper. Then other sub-divisions developed, such as hydraulic, sanitary, etc., but when we get so far as cement engineering the splitting process has become decidedly thin. He is not much of an engineer in these days who is not as well acquainted with the use of cement as with that of steel, while the development of cement manufacture has been managed quite well by the mechanical engineer and the chemist.

The Prospective Mining Engineer

The address by Mr. Kirby to the graduating class of the School of Mines and Metallurgy of the University of Missouri, of which a rather full abstract is published elsewhere in this issue, contains much good advice, not only to those just passing out of school, who are prospective mining engineers, but also to many who are actually in the practice of the profession. Coming from an engineer who has been so successful as Mr. Kirby in the management of large enterprises, the common-sense advice that he gives ought to be appreciated highly by the graduates of 1908. We think that the faculties which lead students through their collegiate course may also profit from what Mr. Kirby says.

Indeed, he says so much of importance that elaborate and valuable essays may be written upon many of the points to which he calls attention. For example, the disadvantage of specialization. Probably, he did not intend to decry the specialist, but many who have adopted the line of ultra-specialization have found to their sorrow that they have made serious mistakes through their lack of general knowledge. We do not want the specialist; nor the generalist; but rather the specialist-generalist, if we may be permitted to introduce that rather awkward term.

Another important point in Mr. Kirby's

address is the emphasis which he places upon the supreme advantage of a good general education, including the ability to use the English language properly; if we do not mistake his views, he puts this rather ahead of the purely technical education. This may be considered somewhat heretical, but the same views are held by many experienced engineers besides Mr. Kirby.

We feel naturally a great interest in Mr. Kirby's recognition of the "remarkable work of the mining journals in developing the professional spirit of engineers, and the feeling of fraternity among all those soldiers of fortune who constitute the mining world." This is a sentiment which we are bound to approve, inasmuch as the ENGINEERING AND MINING JOURNAL has been consistently preaching it for upward of 40 years, and will, of course, continue to do so.

Machine Sampling

The article by Mr. Church, which is published in this issue, opens for discussion a subject that is of supreme importance in the mining and metallurgical industries. The purchase of ores and the determination of technical results are based upon sampling, and it is essential that the methods of sampling shall conform to the soundest principles. We have seen the old method of quartering practically discarded because of its recognized liability to error, and the general introduction of machine sampling as not only more accurate, but also much cheaper. However, there are great differences among the methods of machine sampling, and even the best of them may be subject to error as Mr. Church lucidly points out.

In this connection it is proper to speak of the work of the late Henry A. Vezin, an engineer of sterling merit who did not receive in his lifetime, because of his modesty and unassuming character, the popular and professional recognition that he deserved. However, Vezin's name is indissolubly connected with the subject of machine sampling because of his invention of one of the first machines designed on sound principles, which has come largely into use. Vezin never patented this machine, but made a free gift of it to industry.

In designing sampling works, Vezin always laid great emphasis upon the proper coördination of the parts. His machine was carefully proportioned to the size of the ore to be sampled and other variable conditions, and care was taken to deliver the ore-stream to the sampler at just the right angle, etc. In some of his latest designs, showing two samplers in series, a mixing cylinder was interpolated between the two samplers. The first sampler discharged its cutting into the cylinder, which effected a thorough mixture before delivering it to the second sampler. Of course, this obviated the retardation of certain pieces of ore to which Mr. Church calls attention. The importance of thorough mixture before subjecting the ore to a new cutting has also been emphasized by other engineers, including Argall in his classic paper read before the Institution of Mining and Metallurgy.

British Columbia Mining

The report of the Minister of Mines of British Columbia for 1907, recently published in the JOURNAL, shows a substantial increase in values over previous years. This increase, however, was entirely in coal, coke and clay products, the metals being either stationary, or declining in quantities and values. This does not indicate, however, a serious condition of mining affairs in the Province, but more probably a change in conditions.

Placer gold, at first the attraction which brought miners to British Columbia, has been steadily declining for several years past, and 1907 was no exception. The lower Fraser and Thompson rivers have ceased to yield placer gold in any considerable quantities, while the Cariboo seems to have been rather a disappointment, notwithstanding the large sums spent in ditches and other preparatory work. In the Cassiar and especially in the Atlin district, work was suspended on some of the more promising placers, but may be renewed when the transportation conditions for supplies and machinery are more favorable.

Lode gold also showed a decrease, chiefly in the Rossland district, where the mines are now worked more for their copper than their gold values. About three-fourths of the silver won was in connection with the lead ores of East Kootenay and the Slocan, and this part showed a smaller production, as the lead output diminished in those districts, chiefly owing to smaller demand and lower prices. The remaining fourth comes from the copper mines of the Boundary district and the Coast. These copper mines for the greater part of the year made a large production; but the shutting down of the larger mines in the closing months of the year, owing to labor troubles and the drop in the copper market, prevented them from making the increase in copper and silver production which had been expected.

The coal and coke production, both for home consumption and for export to the Pacific Coast of the United States, was the largest ever reported; and to this was due the increase in total value. The coal industry is growing, and has room for expansion in both of the chief districts —Vancouver Island and the Crow's Nest Pass—while work has been begun on a promising coalfield at Nicola, in the Yale division. British Columbia has the advantage of possessing by far the best and largest supplies of coal on the Pacific Coast, and this is an important point in considering future mineral developments.

So far as metal mining is concerned in the future, much depends on the opening of the country by the new railroads now under construction. Some promising districts are now practically unworked owing to the difficulties of transportation, and most of these will be made more accessible by the building of the Transcontinental and the Grand Trunk Pacific lines. The production of copper in the future is likely to increase with the continued working of the large mines of the Boundary district, of which there is no doubt.

British Columbia possesses some deposits of iron ore which have been hardly touched, or even explored as yet, on account of their situation. The working of these also will be made possible by the new railroads; and with an abundant supply of coking coal, and the facilities for shipping finished products by sea, there is no reason why a considerable iron industry should not be built up in the Province in the next 10 or 15 years.

THE CONDITION of the iron trade in the past six months is shown by the Sault Ste. Marie lock reports. For the season to July 1 the decrease in traffic from Lake Superior was 66 per cent., due chiefly to the small iron-ore shipments this year. The ore shipments this season were only 21 per cent. of the quantity reported a year ago. There was also a heavy decrease in the coal traffic.

Mining in Australasia in 1908

Condition of the Mining Industry in the Southern Continent in the Current Year. Gold, Silver, Lead, Copper, Tin and Zinc

BY F. S. MANCE*

The condition of the mining industry of Australia during the four months ended April 30 shows a continued tendency to turn from the mining of gold to that of the industrial metals.

Gold

The returns of the gold yield of Australasia for the first four months of the year, indicate a decrease of 3 per cent. as compared with the corresponding term in 1907. The following are the figures, in ounces of fine gold:

State.	1907.	1908.	Changes.
Western Australia	555,242	556,353	I. 1,111
Victoria	215,599	190,257	D. 25,342
Queensland	150,936	133,410	D. 17,526
New South Wales	85,885	77,301	D. 8,584
Tasmania	21,500	22,450	I. 950
South Australia	5,000	4,500	D. 500
Total Commonwealth	1,034,162	984,271	D. 49,891
New Zealand	135,381	150,078	I. 14,697
Total Australasia	1,169,543	1,134,349	D. 35,194
Total value	$24,174,454	$23,446,994	D. $727,460

It will be noticed that the State of Western Australia records a slight increase, a good recovery having been made during the month of April. The recent highly encouraging developments in the deeper levels of the mines at Kalgoorlie, taken with the improvements and economies effected in working, indicate that the present rate of production is likely to be maintained, and that the decline in the yield of this State has at last been arrested. The reports from the other States of the Commonwealth, however, are not as encouraging. The shrinkage is general, and the industry may be said to be in a depressed and stagnant condition. The question of encouraging deeper sinking on the Northern goldfields is receiving the earnest consideration of the Queensland government and the sum of £50,000 has been allocated with the object of assisting companies prepared to undertake the testing of the gold-bearing formations at a depth. In this connection it is interesting to note that the New Chum Railway Company on the Bendigo field, Victoria, is opening up a reef from the 4284-ft. level which averages about $5 gold per ton, while the Victoria Quartz Company in sinking a winze below the 4254-ft. level and meeting with encouraging prospects.

Both in New South Wales and Victoria dredging operations continue to be conducted with gratifying results. In the Bright district, Victoria, there are upward of 20 dredges in operation, and the dividends so far declared total £119,000, which amount exceeds the capital invested in the plants.

The returns from the Dominion of New Zealand are in contrast to those of the Commonwealth, and an increase of 14,697 oz. is shown. The Waihi Company, which ranks among the first six gold mines of Australasia, treated 86,306 tons of ore during the first quarter of the year for a return of over £200,000. The ore reserves in this mine at the close of the year 1907 were estimated at 1,300,000 tons of an average assay value of $13.18. The company has installed a gas-producer plant, and a considerable reduction in working costs is foreshadowed.

The value of the gold exported from the Commonwealth to the end of April is £4,104,537, an increase of £2,299,100 over the exports for the corresponding period last year.

Silver and Lead

Operations on the Broken Hill field in New South Wales are in strong contrast with the feverish energy displayed at the same period last year. That lead would fall in price was fully expected, but such a rapid and extensive decline was certainly not anticipated. This is particularly shown by the announcement made by the Broken Hill Proprietary Company at the end of last quarter that, owing to the decline in metal values and the additional costs of material and working, the results would not permit any dividend. For the first time in the history of the company a dividend has been withheld, and thus after 152 consecutive payments totaling £9,752,000 the continuity of the list has been broken. The position of the Proprietary Company is reflected in the reports of the other companies on the field, and so far they have not found it possible to adjust their economies proportionately to the fall in the prices of metals. The new customs tariff, as passed by the Federal Government, has added to the cost of supplies, while the increase of 12½ per cent. in wages granted to the men when lead was at a top price is for a fixed term and cannot be lowered at present.

Other matters have no doubt entered into consideration. It is generally understood that the Proprietary Company is desirous of increasing the smelting plant at the Port Pirie works so as to be in a position to undertake the smelting of the concentrates from some of the smaller mines on the field, which at present are exported to Europe. The South Company has in view the taking over of the works of the Smelting Company of Australia at Port Kembla, the returning charges of the foreign smelting companies being regarded as excessive. The companies were also to make joint provision to finance the auxiliary water supply known as the Umberumberka scheme, which it had been decided to carry out; but in the light of present events this proposal may now have to stand over. The large dividends declared at the end of the year exhausted the reserves and these have to be built up. Clearly the dividends should have been on a much lower scale. The extensive development work carried out during the period of high values has enabled the companies to shorten hands, and as several of the smaller mines have closed down the number of men employed is some 2000 less than in December last. The milling plants have either been reorganized or replaced by modern appliances, and operations can therefore be conducted at less expense and a larger tonnage dealt with. By curtailing underground development work, and the exercise of rigid economy, it is hoped that all the mines will soon appear again on the dividend list. As illustrating the extent to which the industry has been affected it may be mentioned that the value of the silver-lead, concentrates, etc., exported from New South Wales during the first quarter of 1908 is £650,000, or £232,700 less than for the same term in 1907.

The silver mines in the Zeehan district, Tasmania, have been materially affected by the closing down of the smelters of the Tasmanian Smelting Company. The government, recognizing the seriousness of the situation has recommended to Parliament the granting of a loan of £15,000 to the company, repayable in 10 years, and a rebate of railway freights, subject to the condition that operations are recommenced immediately.

Zinc

The producers of zinc concentrates are anxiously concerned as to the result of the negotiations for the formation of a convention by the European spelter pro-

*Sydney, New South Wales.

ducers. The companies here are already greatly handicapped by the high treatment charges on concentrates, the deductions made, and the fixing of the price of the metal on final settlement. The Broken Hill Proprietary Company is making headway with its zinc-smelting plant, and once the works are established on a profitable basis, Australia should, with its resources at command, become a factor in the world's output of spelter.

The Zinc Corporation at Broken Hill seems to have been much more successful since adopting the Elmore process. During the month of April 10,180 tons of tailings, assaying 18.5 per cent. zinc, 4.5 per cent. lead, and 7 oz. silver per ton, were treated and yielded 3090 tons of concentrates assaying 45 per cent. zinc, 7 per cent. lead, and 13.5 oz. silver per ton. In addition 70 tons of leady concentrate, assaying 57.5 per cent. lead, 37½ oz. silver, and 13½ per cent. zinc were obtained. It has been found that by burning off the oil and mixing the product with water, the lead sulphides can be easily separated by the Wilfley tables. It is represented that costs have been so reduced that a profit can be earned even at the present ruling price of metals, and although greater difficulty may be experienced in realizing on the product, still the prospects have been considerably brightened. The other processes in operation on this field are also responsible for the output of an increased quantity of zinc concentrate. The De Bavay plant on the North mine is to be increased to a capacity of 1500 tons. The plant is at present producing a concentrate assaying 48 per cent. zinc.

Copper

When the unfavorable conditions of the metal market are taken into consideration, the report of the Mount Lyell Mining and Railway Company, Tasmania, for the half-year ending March 31 must be regarded as satisfactory. The ore dealt with during the half-year amounted to 202,000 tons, and is within a few hundred tons of the quantity treated during the preceding term. The output for the two half-years is as follows:

Half-year Ended	Blister Copper.	Contents. Copper, Tons.	Gold, Oz.	Silver, Oz.
Sept., 1907..	4,143	4,090	9,334	344,715
March, 1908..	4,301	4,247	10,489	344,608
Year.....	8,444	8,337	19,823	689,323

The net profit earned during the half-year ended March 31 was £128,981, as against £128,728 for the preceding term. Working costs were slightly lower, amounting to $3.688 per ton of blister copper, as compared with $3.704 per ton for the September half-year. From the Mount Lyell mine 139,691 tons of ore were obtained of an average assay value of copper 0.87 per cent., silver 1.90 oz., and gold 0.069 oz. per ton, while 63,250 tons of an average value of copper 5.94 per cent., silver 1.49 oz., and gold 0.004 oz. per ton were drawn from the North Mount Lyell mine. This latter mine has opened up well during the period under review, and developments at the 1000-ft. level are such as to encourage the expectation that the orebodies will be encountered at still greater depths. The known ore reserves in the North Mount Lyell and the Lyell Tharsis mine are now greater than at any period in the company's history. The liquid assets of the company stand at £455,500, and the payment of £45,245 during the current month will free the company from the debenture liability, which was originally £140,000.

The copper production of the State of Queensland for the March quarter of this year was 2754 tons, valued at £163,498, as against 2602 tons valued at £279,694 for the same period in 1907. The Mount Morgan company continues to be the largest contributor, and during the month of May, 19,176 tons of ore were treated and 632 tons of blister copper containing 626 tons pure copper and 8216 oz. gold were produced. In addition, 6800 oz. gold were obtained from ore treated at the gold reduction works. The estimated value of the yield for the month, taking copper at £58 per ton, is £98,000.

The copper and ore exported from the State of New South Wales during the March quarter amounted to 2658 tons valued at £144,975. This value is £90,189 less than that of the same period in 1907. The bulk of the output is being supplied by the Great Cobar mine. The Nymagee and Burraga mines have been closed down, and other mines have considerably curtailed operations.

In South Australia, the Wallaroo & Moonta Copper Company has so far continued operations. This is somewhat contrary to expectation, as it was thought that the cost of production was too high to permit a profit to be earned at the ruling price of copper.

Tin

The production of the tin mines of Tasmania during the first quarter of 1908 was on a much greater scale than for the corresponding period last year, the figures being 1045 tons of black tin as against 586 tons in 1907. The Mount Bischoff company has furnished proof of the success now attending operations by declaring a dividend of 5s. a share. This makes the three hundred and seventy-fourth dividend, and brings the total amount paid by this company up to £2,139,000 or £178, 5s. 4d. per share. Some recently located orebodies are opening up satisfactorily, and the yield for the month of May was 76 tons. The output of the Briseis mine for April was 105 tons of black tin. The shares of this company have recently been the subject of violent fluctuations and heavy realization. This was in anticipation of an adverse report by the company's engineers, Messrs. Lake and Curny, who had been deputed to investigate the ore reserves. The report, which has now been made available, is to the effect that the present rate of output will probably be maintained throughout the current year, but there will be a considerable reduction during 1909 when all of the Briseis southern section, and the best part of the No. 1 property, will have been exhausted. No output can, in any circumstances, be expected from the Ringarooma property during the coming year, and it will probably be two years before sufficient overburden is removed to enable systematic operations on the drift to be commenced. The company's present financial position is a strong one, the reserve totalling £45,000, while the cash in hand exceeds £15,000.

The comparative returns of the tin-mining industry in Queensland emphasize the influence of the decline in the price of the metal. The following are the figures for the March quarter of each year:

	Alluvial Tin. Tons.	Alluvial Tin. Value.	Lode Tin. Tons.	Lode Tin. Value.
1907...	437	£51,848	882	£89,584
1908...	372	28,728	874	58,728

The bulk of the production is still drawn from the Herberton mineral field. The Vulcan mine is the largest individual producer. The output for April was 50 tons of black tin valued at £3100, good ore being obtained from the stopes at the 900-ft. level. Among the other important producing mines may be mentioned the Smith's creek, Stannary Hills, and Gilmore. The dredges at Stanthorpe have contributed a good quantity of alluvial tin.

The tin, ingots and ore, exported from New South Wales during the first three months of the year amounted to 547 tons, valued at £68,136, which is less by some £75,000 in value than for the corresponding period in 1907. The dredges in the new New England district furnished most of this, and the results secured are such as to prove that they may be looked to as a permanent and profitable source of supply.

New Dry-air Blast Plants

The Cleveland-Cliffs Iron Company has decided to put in a Gayley dry-air blast plant at its Pioneer No. 2 furnace at Marquette, Mich. The work will be begun soon.

The Northwestern Iron Company has lately increased its capital, and has begun to make extensive improvement in its mines and its furnace at Mayville, Wis. Among these improvements will be a dry-air plant for the blast furnace.

It is reported that large deposits of manganese ore have been discovered near the village of Biaely Klyutch, in the district of Tiflis. The metallic content of the ore is stated to be more than 65 per cent.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. M. Howbert, of Colorado Springs, is in Chihuahua, Mexico, on mining business.

George A. Laird, of Bisbee, Arizona, has been appointed consulting engineer for the Commodore Mining Company.

George Mainhart has resigned his position as manager of the Champion Mining Company at Nevada City, California.

J. W. Bradley has resigned his position as superintendent of the San Martin mine in the San Juan district, Oaxaca, Mexico.

D. W. Shanks, general manager of the Rio de Plata Mining Company, Chihuahua, Mexico, is in Los Angeles, Cal., on business.

Isaac B. Hudson, of Joplin, Mo., has gone to Sonora, Mexico, to examine some copper properties for parties in Joplin and Memphis.

Sir Charles Craufurd, who is largely interested in South African mines, recently visited the Manitou Lake mining district of Ontario.

M. H. Yeandle has been appointed manager of the Rosario mine of the Alabama-Rosario Mining Company at Taviche, Oaxaca, Mexico.

H. R. Bellamy, of Seattle, Wash., has gone to Graham island, in the Queen Charlotte group, British Columbia, to open a coal mine there.

A. Bement, consulting mining and mechanical engineer, has moved from the American Trust building to 2114 Fisher building, Chicago, Illinois.

Floyd Harmon, formerly superintendent of the Temiskaming mine at Cobalt, Ont., is now in charge of the Cochrane mine in the same district.

Dr. Robert H. Richards is making a professional tour through Arizona, Utah, Colorado, Montana and Idaho. He expects to return to Boston late in August.

J. H. Plummer, president of the Dominion Iron and Steel Company has sailed for England in connection with the financial reorganization of the company's affairs.

M. C. Potter, chairman of the Southern department executive committee of the American Smelting and Refining Company, is in New York from Mexico on business.

W. G. Nichols, for some time assistant superintendent of the Taylor Iron and Steel Company, Highbridge, N. J., has resigned to take charge of manganese steel works in Chicago.

H. R. Conklin, for several years manager of the Missouri Lead and Zinc Company at Joplin, Mo., has taken charge of the Lluvia de Oro mine in Chihuahua, Mexico, as general manager.

Stewart R. Dow, president of the Franklin Mining Company, has been at the mine in the Lake Superior copper country, accompanied by H. M. Howard and Henry Tolman, directors.

Carl A. Allen and C. Lorimer Colburn have formed a partnership as mining engineers, with office at 614 Ideal building, Denver, Colo. They will conduct mine examinations, geological and topographical surveys.

T. J. Leavitt, formerly chief electrician of the Real division of the Real del Monte Company, at Pachuca, Hidalgo, Mexico, has accepted a position with the Benito Juarez Company, in charge of the mechanical and electrical departments.

C. S. Herzig, consulting engineer, of London, passed through New York this week on his way to Nicaragua, where he will be occupied in the examination of mines during the next three months. He will return to London by way of New York.

Edward K. Judd, formerly on the staff of the ENGINEERING AND MINING JOURNAL, has been appointed instructor in mining in the School of Mines of Columbia University, and will assume the duties of that position in September. Mr. Judd starts from New York for Colorado this week, on professional business.

Obituary

Charles E. Lyon, formerly connected with the Calumet & Hecla mines at Calumet, Mich., but for some time past superintendent of the Michigan Carbon Works in Detroit, died in that city July 5, aged 62 years.

Joy Pollard, who died at Murrietta Springs, Cal., July 5, aged 55 years, was born in Michigan, but had lived in Nevada 40 years, with the exception of a few years spent in Colorado. He was a pioneer in the discovery of several of the southwestern Nevada districts, and was widely known as a miner and prospector.

William Dwight Zehner died suddenly of apoplexy July 12, while on a visit to Lancaster, Penn. He was 62 years old, and was one of the best known and most prominent engineers in the anthracite country. For 37 years he was superintendent and general manager of the Lehigh Coal and Navigation Company. He retired from that position in 1905, and since then had been consulting engineer for the company.

Societies and Technical Schools

Western University of Pennsylvania—A contract has been let for for the new building of the School of Mines at this institution at Pittsburg. The building will be 85x130 ft., three stories high and will cost $175,000. Work is to be begun at once.

International Congress of Applied Chemistry—The seventh international congress of applied chemistry will be held in London, England, from May 27 to June 2, 1909. An organizing committee has been formed for the purpose of making all arrangements for the holding of the congress in London. This committee consists of representatives of many societies, including the Society of Chemical Industry, Iron and Steel Institute, Institution of Mining Engineers and Institution of Mining and Metallurgy. Previous congresses have been held in Brussels (1894), Paris (1896), Vienna (1898), Paris (1900), Berlin (1903), and Rome (1906). The work of the congress has steadily grown in importance, and it is hoped that the London congress may be a worthy successor to those which have gone before. The secretary of the committee is William Macnab, whose address is 10 Cromwell Crescent, London, S. W., England.

Canadian Mining Institute—A recent circular from the secretary gives the itinerary of the first and second stages of the summer excursion of the Institute; the third stage will be given later.

For Stage 1, the Nova Scotia and Quebec excursion, the start will be made from Quebec, Aug. 24, after a day spent in that city. Aug. 26 the party will arrive at Sydney, Cape Breton, and three days will be spent in visiting the coal mines of the Dominion Steel Company and the works of the Dominion Iron and Steel Company. One day will be spent at the Acadia Company's collieries at Stellarton, and another in visiting the asbestos mines at Thetford, Quebec, and vicinity and the Canadian Chrome Company's mines and works at Black Lake. The party will arrive at Montreal Sept. 1 and spend the next day in that city.

For Stage 2, the Ontario excursion, the program provides for arrival in Toronto Sept. 3, and a trip to Niagara Falls by steamer across Lake Ontario to Lewiston, and thence by gorge railway to the Falls, where the day will be spent. Sept. 4 will be spent in Toronto, where the party will be the guests of the Toronto National Exhibition. The train will leave in the evening and arrive at Cobalt Sept. 5. The principal mines of the district will be visited, the arrangements being in the hands of the Cobalt branch of the Institute. Sept. 6, leave Cobalt and arrive at Sudbury, and Sept. 7 a visit will be paid to the Moose Mountain iron mine. On Sept. 8 the party will be the guests of the International Nickel Company, whose Copper Cliff smelter and Creighton mine will be visited.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Goldfield, Butte, Salt Lake City, Denver, Toronto and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 10—Not long since two men named Reams and Lang from the agricultural regions of Solano county went into the mining regions of Yuba county and located a claim on what they supposed was vacant Government land. They struck ore of phenomenal richness, took it out, sacked and shipped some of it. Then along came J. C. Campbell, who said the claim—the Solano Wonder—was on his ground and told Reams and Lang to quit. They did not do so and he got out an injunction against them. After this they still sacked some ore and concealed other sacks previously mined. Then Campbell had them hauled up for contempt of court, while meantime another claimant for the mine appeared. This week the court purged Reams and Lang of contempt of court, deciding that there was nothing to prove that the men had hidden the ore in anticipation of an injunction, as they contended they had merely done this for safe-keeping. The burial of the ore was witnessed by several respectable residents of the neighborhood. Reams and Lang are still in possession and now a suit to determine the actual ownership of the rich ledge is to come up this month.

Manager S. W. Cheney, of the Pennsylvania Dredging Company, of Oroville, Butte county, which has been enjoined by the county of Sutter pending an investigation of alleged damages by mining tailings, states that he has no intention of violating any injunction or doing any damage to the river. He is about to confer with the Sutter supervisors and attempt to compromise the matter. This he can doubtless do by more perfectly landlocking his dredge, as has been done by either dredge-owners of the district, who have no fear of any trouble with the Anti-Débris people.

In this connection it has just developed that about two months ago a new or opposition anti-débris association was organized, the members of which did not believe that the old one was doing its duty in stopping infractions of the Caminetti law. It is this new association which has tried the plan of beginning suit against the mines instead of the owners. The fact is, however, that that plan was tried years ago and failed, because the companies disincorporated, and there was no company to sue, and it was impossible to sue and enjoin a mine which had no corporate existence. The citizens who have started the new organization deny that they have founded a new anti-débris association, but say they have merely joined the supervisors of Yuba county to lend moral support to the cause. Nevertheless, through their efforts the North American hydraulic mine at Whiskey Diggings, Sierra county, has been served with injunction papers by Yuba county, the suit being brought against the mine itself. How this will result is yet to be seen. The North American mine has been closed down in obedience to the order of the court, and a man was left in charge to see that operations are not resumed.

What is supposed to be the largest gold dredge in the world is in course of construction on the Marysville Dredging Company's grounds at Marigold, seven miles from Marysville, Yuba county. It will be known as Dredge No. 3, and will cost $150,000, taking eight months to complete. Not only is the company to build this big dredge, but it will make other improvements at Marigold. New cottages will be erected for the men and other improvements will be made that will entail an expenditure, all told, of $200,000, and give employment to an increased force of men. The operations of this company on the Yuba river are becoming more extensive, and it is using every known modern device and apparatus in the dredging business.

Title to part of the Five Pines group of mines between French Gulch and Trinity Center, is involved in a suit on trial in Trinity county. The issue is between a mineral location and a railroad patent. H. J. Van Ness located the Five Pines a few months before the railroad received a patent to a section of land that overlapped part of the group. John Roney and others, of Siskiyou county, bought the section from the railroad and went to mining on the ground. The question for the court to decide is, can a mineral location made prior to the issuance of a patent to railroad land hold the mining ground as against the patent?

The old South Eureka mine at Sutter Creek, Amador county, has at last come on a body of ore of good size and high grade. A large portion of the time of the 20 years in which the mine has been working it has been kept going by means of assessments on the stockholders. They have at times found small bodies of rich ore and large ones of poor ore, and the 20-stamp mill has kept going. Now, however, in view of recent developments 20 more stamps are to be added to the mill.

The United Gold and Copper Company has done considerable work on a quartz mine near Cherokee, Butte county, but dissensions among New York and Chicago stockholders caused a cessation of operations. For a time after this the salary of superintendent A. M. Wilson was paid regularly and then payments stopped. Recently he filed a complaint for a lien of $2615 for services rendered the company. The United Gold and Copper Company filed a demurrer, but Attorney Gardner, of Oroville, gave notice of a motion to set aside the demurrer on the ground that the defendants had no duly authorized agent in the State on whom a process of Court could be served, nor were there any documents on file in the State showing there was any such agent. Judge Gray granted the motion and set aside the demurrer. Judgment for the amount claimed and costs were given by default. The point raised by Mr. Gardner was a novel one, and the ruling of Judge Gray in his favor is a warning to corporations outside the State to maintain their legal standing by keeping a representative here.

The old Waterloo silver mill, for 20 years or more a familiar landmark of the desert at Daggett, San Bernardino county, has passed into history. The Borax Properties, Ltd., a company which is erecting a borax plant at Otis, has bought the mill and is moving it to the building site in Otis. All the machinery was sold to Robert Newell, a junk dealer, and he will commence blasting it up for shipment.

A new mining company was organized last month at Escondido, in San Diego county, which is to do a general mining business, and it has divided this up into four departments, each to be handled by a separate committee. One of the committees is on "Mines," another on "Finance," another on "Agencies," and another on "Advertising." This is rather a novel plan, especially the last named department. As a general proposition advertising does not receive much attention from mining companies, except such new ones as have treasury stock for sale.

The Landecker drift gravel mines, south of Placerville, owned by the Landecker Mining Company, have been sold at sheriff's sale to Thomas Clark, of Placerville, who brought the suit and who bought the property for the amount of the judgment and costs, amounting to a little over $20,000. As soon as permanent rights can be obtained it is likely that work will be resumed. The property includes some of the most promising gravel deposits in El Dorado county. While Mr.

Clark has not yet announced his intentions regarding the property, it is safe to say that he will not permit it to lie idle after the time for redemption has lapsed.

San Bernardino county has a new high-grade camp in the district of Kewanee, in the Kessler ranges, seven miles from Cima on the Salt Lake route, and six miles from Ivanpah on the Santa Fé route. More or less work has been quietly carried on for the past year, but only of late have developments attracted any attention. There are now six companies in the camp taking out ore; among them are the Kewanee Gold, the Kewanee Gold Extension, the Meadowville, the Sunnyside and the Chicho mining companies. The ores run from $20 to $80 per ton it is said, and some of the stringers in the veins are of very high grade.

The Boston Consolidated Mines Company, or old Esperanza mine, in Mokelumne River mining district, Calaveras county, continues to make phenomenal daily yields with only two men at work. It is a drift gravel mine near the Boston quartz mine. The gold is being taken out while drifting along the channel to find its length, no crosscutting having been done as yet. So far as proven the rich channel seems to be extensive. Clean-ups of the sluices are made every night.

It is reported that the several extensive gold-mining properties at Hedges in the Colorado river valley, San Diego county, have changed hands, and that the syndicate now in control plans renewed activities. Formerly there were several hundred men employed at the Hedges mines, and a railroad carried the ores down to the river for treatment. Now, it is said, the cyaniding plant will be moved up to the mines. At one time the Golden Cross mine at this place was the most productive gold property in Southern California.

The old Mineral King district in Tulare county, discovered in 1870, is about to be reopened by men who intend giving it a thorough prospecting with diamond drills. About a million dollars was expended at the camp in 1880 and a large mill built. The ore was refractory and finally a snowslide carried away the tramway and a number of buildings and the place became deserted.

Salt Lake City

July 11—Articles of incorporation of the Bingham & Garfield railroad, filed this week, created considerable interest here. While the document fails to give details concerning future plans, and officials of the Utah Copper Company, who are the incorporators, refuse to give further light, it is presumed the line is to be built in accordance with a plan to operate the Utah copper mine upon a much broader scale than at present. It has been officially stated that the capacity of the Garfield mill, which is equipped to treat 6000 tons of ore per day, is to be materially increased, thereby demanding more equipment to transport ore to the place of treatment. It has been declared by the management of the copper company, however, that the construction of the proposed line will in no way indicate the abrogation of the traffic contract with the Rio Grande Western Railroad Company. The copper company already has 10 miles of standard track which is to become the property of the new organization. The ultimate length will be 30 miles, situated in Salt Lake and Tooele counties.

The United States Smelting, Refining and Mining Company has again begun the purchase of ore for treatment in its lead smelter at Bingham Junction, which will be placed in operation during the latter part of the month.

Goldfield, Nevada

July 7—George Wingfield returned this week from a long trip to San Francisco and set at rest several rumors about the Consolidated and his other interests. It is admitted that he has bought the Myers interest in the Combination Fraction. Wingfield says his purchase was for the Nixon-Wingfield interests and not for the Consolidated. The Combination Fraction is surrounded on the north, east and west by bonanza ground of the Consolidated and on the south by the Florence bonanza, and while it has produced a large amount extracted by leasers—notably the Loftus-Davis-Sweeney lease—it has never developed any of the high-grade ore which has been mined on all sides of it. Its purchase by Nixon and Wingfield is significant. So also is the election of Wingfield to the directorate of the Kewanas Mining Company.

The Supreme Court of the State has issued a writ of certiorari to the district court of this district and the presiding judge, directing the court to furnish copy of all proceedings in the matter of adjudging Tom Lockhart and the Florence company in contempt of court for refusing to deposit the $117,000 ordered impounded by the court. On petition of the Florence company the Supreme Court will review the case.

The electric-power plant at Bishop, Cal., about 113 miles west from Goldfield, which supplies Goldfield with light and power, will increase its capacity to 30,000 horse-power.

The Consolidated new mill is rushing toward completion. All the foundations will be completed within 10 days. Much of the machinery is on the ground and the balance is on the way. Part of the steel gang has arrived, and the first of the steel is expected any day. All rumors of J. H. Mackenzie's resignation as general manager are indignantly denied.

The Florence, which has been paying the old scale of wages, has this week reduced to the mine operators' or Tonopah scale.

The Rogers Syndicate lease on the Florence company's ground has had an accident which prevented any hoisting throughout one entire shift, which means much to their lease which is hoisting picture rock and which expires July 11. The crosshead stuck on the 200-ft. level and hung until the bucket reached the 500. Then it fell 300 ft. and put the shaft out of commission. No one was hurt. The lease is expected to make a spectacular finish. Expert ore sorters are at work "sweeping" the old stopes and drifts for high-grade, which process is expected to net $50,000 or $60,000 of ore. The richest ore yet encountered in the lease has been struck in a winze from the 500-ft. level 85 ft. deep. The orebody here has been opened up for 65 ft. on its strike and it contains a high-grade streak about 2 ft. wide. This lease produces $10,000 to $15,000 worth of ore per day, at a total expense of about $700. The total pay roll contains only 85 names. The lease has produced more than $500,000 and has paid $245,000 in dividends. The lease ran all day Fourth of July, the miners receiving double pay. When the lease expires the machinery and equipment will be moved to the Baby Florence, which will be operated by the same management.

Butte

July 9—Production from the mines of the Boston & Montana company still continues to be reduced approximately 50 per cent., awaiting the repairing of the Great Falls smelter, which sustained severe damage during the floods in the early part of June. The management is taking advantage of the enforced curtailment by concentrating its energies on repair work. The retimbering of the Pennsylvania shaft is progressing rapidly. The miners in the camp were given a holiday July 4, only those whose work could not be dispensed with, such as pumpmen and hoisting engineers, being required to report. The annual spring exodus of miners who go out each year into the surrounding hills to prospect, has not been as marked as in previous years.

Denver

July 11—The work on the Newhouse tunnel, the importance of which work was described in the JOURNAL of June 6, is being retarded by the "dog in the manger" policy of the few, who so often crop up to injure the interests of the many. These people would like their mines unwatered at the expense of others, but under the present policy of the Tunnel Company, this will not be possible, and it is, therefore, to be hoped that the obstructers will see their error.

In the Saratoga mine, in a lateral driven 2300 ft. from the Newhouse tunnel, a strike of a large body of rich ore at a depth of 4400 ft. below the surface, is just reported.

It is stated that J. Parke Channing is making an examination of the dredging ground of the Breckenridge gold placers for New York people, and that on the result of the same depends the purchase of two large dredges.

Recent strikes in the Cripple Creek district at from 1100 to 1500 ft. prove the existence of ore at those depths and demonstrate the possibilities of its gold-producing area on the completion of the deep-drainage tunnel, the work on which is steadily progressing.

Scranton, Penn.

July 14—In the appeal cases of the coal companies from the tax assessments made by the county commissioners, the Lackawanna county court gave its decision on July 13. This decision, while it reduces the assessment materially, is not all in favor of the companies. In the preliminary proceedings an agreement was reached, under which the actual area of coal in the county could be computed. Excluding coal unminable on account of caves or squeezes, coal in veins less than 2 ft. thick and barrier pillars, the total in the county is estimated at 237,000 foot-acres, from which the court ordered one-third to be deducted for pillars to be left in mining. After carefully going over the evidence on both sides, the court held that the fair average value of coal in the ground is $150 per foot-acre. Applying the same rule as for surface property—assessing at 40 per cent. of value—the assessment on coal is to be $60 per foot-acre, the deduction for pillars to be made from all areas.

It is not probable that any appeal will be taken, as all parties agreed to accept the ruling of the court. The assessment as fixed by the court will, therefore, stand. It is larger than in previous years, but is only about one-third of that made by the county commissioners.

At the Hampton colliery the work of flushing ashes into the old workings, to support the roof and make the robbing of the pillars possible, is going on steadily.

The United Mine Workers are making a strong effort to bring back men who left the union during the past year, and to draw in non-union men. A special appeal has been made by President Lewis, and the initiation fees will be reduced from July to Dec. 1. There has been a large falling off in membership, and the efforts now are directed toward a restoration of the efficiency of the union.

Birmingham, Ala.

July 11—For the past two months the United Mine Workers of America have been very active trying to organize the non-union mines of Alabama, but without much success. Since the long strike, which ended about three years ago in the defeat of the union by the large iron companies, those companies, with the exception of the Alabama Consolidated Coal and Iron Company, have been operating non-union, as has also the Pratt Consolidated Coal Company, by far the largest commercial coal company in the State, and a few of the smaller commercial operators. Since that time and until very recently no attempt has been made by the United Mine Workers to reorganize the non-union mines, and in fact the Alabama Consolidated Coal and Iron Company, and a few of the commercial operators have broken away from the union and operated open-shop.

The contract between the commercial coal operators and the United Mine Workers expired July 1, and was not renewed, the operators demanding a reduction of 10c. a ton in the mining price and a corresponding reduction in the day wage scale; while the miners demanded 55c. per ton, which is a reduction of only 2½c. from the 57½c. price prevailing prior to July 1. As a result of the disagreement all commercial mines have been idle, with the miners on strike since July 1, except two very small companies, the Palos Coal Company and the Braehead Coal Company, which signed up at 55c. with the union.

The United Mine Workers are making a desperate effort to reorganize the non-union mines and have five national organizers from Northern States, besides large numbers of local labor leaders and organizers at work in the various coal districts. As stated above, however, they are meeting with scant success, owing to the fact that so many of the miners who went through the last strike are thoroughly disgusted with the way it was conducted, and the fact that mines in this non-union district have worked so much more steadily and peacefully since the strike than has been the case in union districts; in fact some of the former union leaders are now the most bitter against them. The movement at this time, following on the heels of the panic, has but little public sympathy in this section.

The Union has now called a strike of all non-union mines, effective July 6, but it is not thought that many men will quit work in response to the call, although threats of violence have already been made. The commercial operators expect to start their mines working open-shop shortly, and expect to have a normal output or nearly so by August.

London

July 4— The invitation to visit Canada, sent by the Canadian Mining Institute to the members of the Institution of Mining and Metallurgy, has been accepted by several members. The institution will be officially represented by William Frecheville and Hugh Marriott, both members of council. The secretary, C. McDermid, will also accompany the party.

The prospectus of the Boscaswell United Tin and Copper Mines, Ltd., in Cornwall, referred to in a previous issue, has been withdrawn.

The report of the inspector of mines for the Southern district of England, which includes Cornwall and Devon, for the year 1907 has been issued. The inspector calls attention to the failure of the efforts made in recent years to reopen some of the old Cornish mines, attributing the failure largely to insufficient development underground. Too much money has been spent, he thinks, on surface plant. It must, however, be remembered that in order to open a mine which has been abandoned for many years, efficient plant for winding and pumping must be erected before the old workings can be entered or explored. The real cause of the failure of the new companies and syndicates is mainly due to the lack of sufficient capital. The funds raised have put the mines in some sort of order, but have not been sufficient to enable them to be properly developed. Managers are not slow to carry on development work if they have the money. The fault lies generally with the promoters and their advisers, who commence work without sufficient capital to open out the mine so that it can be worked on economical lines with plenty of ore reserves developed. In the early days of Cornish mining, when workings were shallow, a small capital was sufficient to put the mine on its legs and after that profits provided the funds for further development. With deep mines, large pumping plants and heavy winding engines are required, while the expense of up-keep is high, so that unless a mine has ample cash, it may come to the end of its resources before it has been sufficiently opened up to enable profits to be earned.

The statistics for Cornwall record 88 mines at work, employing 4595 persons below ground and 3958 persons on surface, or a total of 8553.

Most of these 88 mines are doing little or no work, and very few—not half a dozen according to the inspector—are paying.

Another large amalgamation of Rand mining companies is announced. A provisional agreement has been signed, whereby the Village Deep, Ltd., will purchase all the assets of the Turf Mines, Ltd., for 536,250 Village Deep shares. The new Village Deep will consequently have a capital of £1,060,677.

The scheme has been reported on by J. S. Curtis, an independent engineer, who allows 10 per cent. less ore per claim and 1s. less profit per ton for the Turf mines in calculating the terms of the amalgamation. It is announced that the Village Deep plant is to be increased to a crushing capacity of 41,000 tons per month. The Village Deep has a debt of about £150,000, and the Turf mines has about £600,000 in cash, which will now be used for paying off the Village Deep debt, and for increasing the mill and continuing the development of the Turf mines claims.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

JEFFERSON COUNTY

Republic Iron and Steel Company—This company has just blown in its No. 3 furnace at Thomas. This is the first time for over a year that all three of the stacks at this plant have been in blast at one time.

Woodward Iron Company—This company has completed its No. 3 furnace at Woodward, which has been under construction for nearly two years. It will be put in blast before the end of July.

Arizona

GILA COUNTY

Arizona Commercial—This company is planning to build smelting works of 300 tons daily capacity.

GRAHAM COUNTY

Arizona Copper Company, Ltd.—This company reports that the production of its mines and works at Clifton in June was 1500 short tons of copper.

MOHAVE COUNTY

Treasure Hill—The shaft on this property is down 170 ft. at Stockton Hill. At the bottom a drift has been run off on the vein 85 ft., its ore showing the entire distance without a break. It is of a high shipping grade. The entire width of the drift is also in milling values, but a small streak of high-grade ore accompanies this wide body.

Union Basin Mining Company—This company, at Union Basin, has just shipped the second carload of zinc ore for the month to the smelter at Iola, Kan., for treatment. The first carload ran 50 per cent. zinc, besides some gold and silver. John Boyle, general manager, has a number of miners at work opening up the mine.

Last Chance—A drift is being run on this property at Wallapai Springs, to tap the vein below the water level. In the shaft there is a good body of ore of a shipping grade. O. D. M. Gaddis, of Kingman, is the manager.

Bonanza—James W. Guinn, owner of a number of claims in Bonanza Wash district, reports that he has cut the vein in his tunnel at 90 ft., but has found no walls.

Golden Gem—Work is under good headway on this mine at Cerbat and the timbering of the old shaft will be completed in about 10 days. J. W. Moore, manager, is now on the ground.

Goldflat Group—E. A. Whitard, of Goldflat, is in Los Angeles to close the deal on this group of mines and claims. Mr. Whitard will in a few days begin active operations. A big steam hoist is to be installed at once and the shaft sunk 300 feet.

Gold Eagle—S. A. Tyler has sold this property at Mineral Park to a Los Angeles company represented by F. P. Andrews.

YAVAPAI COUNTY

United Verde—This company is said to be producing about 3,000,000 lb. of copper monthly, running four furnaces.

California

AMADOR COUNTY

Amador Queen—The owner of this mine near Jackson, J. R. Phelps, has renewed the leases for another year to M. Thomas and others who have been successful in "pocket" hunting in the property.

Central Eureka—It has been decided to reopen this mine, and the old shaft is to be repaired to the bottom. E. C. Voorheis, of Sutter Creek, will have charge of the work.

BUTTE COUNTY

Cape Horn—The gravel mill at this property, C. M. Hendrix, superintendent, has been completely installed. The gravel is showing good pay.

CALAVERAS COUNTY

Calaveras—The owners of this mine at Indian creek have leased the South Bank claim, and machine drills are being put in.

Ritter—In this mine at Sheep Ranch they have 3 ft. of good milling ore at the 200 level, and have started up the mill.

EL DORADO COUNTY

Big Cañon—At this property near El Dorado, A. T. Fuller, superintendent, a 60-stamp mill is to be erected.

INYO COUNTY

Josephine—The Southern Pacific is building to Keeler and this will bring the old Coso district within 17 miles of railroad transportation. J. D. Nelson, owner of the Josephine, has a small mill on the property and intends erecting a larger one.

MONO COUNTY

Lucky Boy—Goldfield, Nev., men have purchased this mine on the Hawthorne-Bodie grade, four miles from Hawthorne, and have commenced work upon it.

NEVADA COUNTY

Ethel—At this mine near Graniteville, which has been idle the past year, preparations are being made for a resumption of work. Albert Maltman is manager.

PLUMAS COUNTY

Johnson-Graham Mining Company—This company, Charles Stark, Jr., superintendent, is working the old Plumas Eureka mine at Johnsville, formerly owned by the Sierra Buttes Mining Company, and is now milling ore from the "76" claim.

Plumas-Mohawk—This company at Johnsville, is about to put in stamps, as the rock is becoming harder. At present two Huntington mills are in use.

Seneca Mining and Milling Company—This company, working the White Lily mine, has added 20 stamps to its milling capacity, and has put in a Pelton wheel and water hoist.

SAN BERNARDINO COUNTY

G. F. H.—This group of claims, eight miles north of Ludlow, has been bonded by G. F. Hale to Pasadena men, who have begun work on them.

Paradise Mountains Mining Company—At this property in the Paradise mountains, 22 miles north of Barstow, the mill is now steadily at work on satisfactory ore. H. Galeron is superintendent. Five stamps are to be added to the mill.

Hasson Group—At this group in the Ord mountains, 12 miles south of Daggett, there is a good hoist, compressor, etc., and a 10-stamp mill is to be put up. The ore has heretofore been shipped to the Peyton Chemical Company. Geo. L. Hasson is president and manager.

SAN DIEGO COUNTY

Colorado Mining and Milling Company—This company, working in Grapevine district, 15 miles from Julian, is driving a long tunnel which is now in 870 ft. The ledge is a very wide one.

Dulzura—At this camp the Dulzura Gold Company, which has been operating in an open cut, has decided to sink a shaft. The active mines in the district are the Buckhorn, Artery Consolidated, Pasadena, Bee Farm, Eureka, Wounded Deer, Fiddler Gulch, Iron Crown, Katherine C. and Keene & Nelson. Only a few men are employed in each of the properties named.

SHASTA COUNTY

Brackett—This mine has been started up again. A gasolene engine operates a blower to force air into the tunnel and three shifts of miners have been set at work. H. O. Cummins is in charge again

SIERRA COUNTY

Alaska Mining Company—Two new transformers have been installed and the large centrifugal pump again started at this mine at Pike City, G. St. George, superintendent. A new shaft is to be started west of the old one.

Eastern Cross—This is the latest mine in the Alleghany region to record a strike of high-grade gold ore. Bovee Brothers are working the property.

Mongor—This company, working the old Young America mine at Forest, finds that the pay gravel extends beyond the old workings. The main tunnel is being extended.

SISKIYOU COUNTY

Fillipi—This mine at Hawkinsville, is reported sold to Francis D. Cooper for San Francisco and Chicago men. The water supply is now to be materially increased.

TUOLUMNE COUNTY

Riverside—Operations are about to begin on this mine near Soulsbyville under superintendency of J. F. Boggs. Twenty stamps will be added to the 10-stamp mill. A cyanide plant will also be put up.

Springfield Mining and Development Company—This drift gravel mine on the Table Mountain Channel, J. M. Buthenuth, superintendent, has put in new boilers and a rotary gravel crushing mill.

Wildcat—Superintendent R. L. Hendricks is putting up a hoist and other machinery at this mine above Soulsbyville.

Colorado

LAKE COUNTY—LEADVILLE

Baby Shaft—The lessees have sunk this shaft, California gulch, another 100 ft. and started two drifts east and west, locating the orebody, from which shipments will start during July. Another set of lessees is is working the ore on the dump by the old jig process and shipping concentrates that carry 60 per cent. lead.

Iowa Gulch—A great deal of prospecting is going on in this section of the district outside of the work that is being carried on in the shipping properties. A number of eastern parties owning ground in the gulch have visited their claims, and made arangements to resume work at an early date; the most prominent among them being George W. Thatcher, of Albany, N. Y., the sole owner of the Illinois, situate at the head of the gulch. The principal shippers in the gulch are the Lilian, Helena, Aurora and Anona, and the bulk of the ore shipped carries gold chiefly.

Lovejoy—A good grade of iron is being shipped from this property, Rock hill.

Progressive—This property, Fryer hill, is being worked by L. R. Johnston, of Denver, and during the week in the lower level, a rich streak of lead ore was caught, carrying some gold. The streak is being developed.

Star of the West—At Iron hill, recently, a good streak of iron ore was encountered in one of the lower levels and shows signs of leading to a separate orebody. The ore runs well in silver and carries considerable excess of iron.

Tiger Tunnel—Thirty years ago this property, Iowa gulch, was worked, and from the surface considerable high-grade ore was shipped; since then it has been idle. James Hurley and associates secured a lease on the ground a few months ago, cleaned out the tunnel and then started an upraise at the breast, 300 ft. After going up several feet a vein of ore 4 ft. wide was caught and from this a carload of ore has been taken that will hold up to $20 per ton.

GILPIN COUNTY

Anchor—An air compressor plant has been installed at this mine in Willis gulch. Forbes Rickard, Denver, Colo., is manager.

Eureka—Oklahoma capital has become interested and will install a steam plant of machinery. J. G. Striffler, Tolland, Colo., is manager.

Galena—Detroit, Mich., and California people are interested and they are figuring on starting up soon. They are organized as the Alpha Gold Mining Company.

Hubert—After an idleness of about eight years, this property in Nevada district is being started up under the management of H. C. Bolsinger, of Bald Mountain, Colo. The top plant and buildings are being overhauled and as soon as some of the water can be taken out, leasers will be put to work in many of the levels.

Maryland Mountain Milling Company—Colorado and eastern people have taken over the Oliver mill in Chase gulch, and are going to run it on ores from the Adduddell property in Russell district. The capacity will be increased to 75 tons per day by additional equipment. B. E. Granville, Central City, Colo., is manager.

Paola—E. G. Watson and others, of Denver, have secured a lease and bond on this property in Leavenworth gulch and have commenced developments.

Saratoga—In driving the lateral from the Newhouse tunnel and at a distance from the tunnel of 2300 ft., a 4-ft. body of ore has been opened up which carries gold and silver. John Owen, of Idaho Springs, Colo., is manager of the Saratoga Development Company.

Siren—Colorado and Indianapolis, Ind., parties are interested in the Moon gulch section near Rollinsville, and they are installing a plant of machinery and putting up buildings. Louis C. Todd, of Rollinsville, Colo., has been appointed manager.

SAN JUAN COUNTY

Bandora—William Sullivan, owner of this mine near Silverton, has a force of men at work putting it in condition for the summer operations.

Cinnamon Pass Mining Company—This company has been organized by J. B. Ross, L. L. Haines, G. B. Pratt and J. S. Fox. The company is organized to acquire and operate properties in the vicinity of Cinnamon Pass. They are now working on the Isolde and other claims owned by the Dupree Mining Company. The results so far have been satisfactory.

Gold Mines and Power Company—This company has an electric power plant under construction on Bear creek. Burton A. Smead, Silverton, is manager.

Pittsburg & San Juan—Superintendent E. A. Smith has a force of men at work in this mine. The crosscut tunnel is now in a distance of 530 ft. from the entrance.

TELLER COUNTY—CRIPPLE CREEK

Comanche Plume—A steam hoist has been installed at the Baker & Co. lease on the Mountain Goat claim of the Comanche Plume Gold Mining Company, and the lessees have begun hoisting ore. A strong vein of oxidized ore is under development at 150 ft. depth.

Delmonico—Sinking is in progress at the main shaft on this mine on Bull Cliffs, near Altman, and a depth of 975 ft. has been attained. The shaft is to be continued to 1100 ft., and at this depth a crosscut will be carried in expectation of cutting the extension of the Vindicator No. 2 vein.

Idaho

SHOSHONE COUNTY

Charles Dickens—The new concentrator has been put in operation and a week's trial run made, in which the machinery has been proved entirely satisfactory. There has been but a small crew at work, and only a small amount of ore has been treated, owing to the fact that the Frue vanners and settling tanks have not yet been completed. In another week these will have been furnished, and the mill will be ready for full operation. There is already a large quantity of ore banked, sufficient to keep the mill busy at its normal capacity, 150 tons daily. This plant replaces a 75-ton mill that was burned last winter. The ore will all be sent to Salida, Colo., and shipments are expected to begin within a fortnight.

Hecla—This mine is now working at its normal capacity, turning out 350 tons of ore a day, which is being treated at the company's mill. Shipments to Salida, Colo., are being made regularly. A crew of 140 men is now employed on the 600-

and 900-ft. levels. The double compartment shaft is to be started this summer.

Indiana

CLAY COUNTY

Indiana Coal and Clay Mining and Fire Proofing Company—This company, of Brazil, has been incorporated to mine coal and clay and to manufacture all kinds of clay products. Charles R. McGaughey, Henry T. Tilsworth and R. L. Shattuck are directors.

Michigan

COPPER

Superior—Shaft No. 2 is being enlarged to accommodate two skipways. This shaft was sunk with a single compartment to a depth of 235 ft. and work was then suspended, awaiting further developments at No. 1 shaft; as soon as this enlargement has been made sinking will be resumed. No. 1 shaft is nearing the 10th level and from that point a crosscut will be driven to cut the lode. Drifts on the vein from the upper levels continue to yield good copper. A permanent rock house is to be erected and will be ready to furnish rock upon the completion of the railroad spur connecting with the Atlantic road.

Quincy—A new shaft is being sunk on the Pontiac tract. This shaft is to be known as No. 9 and is located about 2800 ft. north of No. 8, or Mesnard shaft, the present north shaft. This shaft commands the ground tributary to the tract purchased from the Arcadian company. The site was established last year and considerable work was done in clearing away for the surface plant, but all work was suspended during the winter. Drifts to the north from No. 8 shaft, and within a few hundred feet of the line of the proposed shaft, are yielding good copper rock.

Michigan—Work has again been suspended on the stamp mill being erected at Keweenaw bay on account of market conditions. The building is erected and practically all of the machinery is on the ground; had the force of men been retained the mill would have been ready for operation early in the fall.

Calumet & Hecla—Due to a breakdown of one of the large compressor engines, Nos. 17 and 18 shafts on the Osceola amygdaloid and No. 21 on the Kearsage lode are temporarily closed down for want of air. This shut-down will be only for a few days, as the two new 125-drill compressors that are being installed at the central plant, are practically ready to go into commission, and when in operation will furnish ample air. Production will not be decreased because No. 17 is the only producing shaft of the three, and its output is small. The pumps have been taken out of the Delaware shaft of the Manitou property and the shaft will be allowed to refill with water.

Mass—About 600 tons of rock are being shipped daily. Production comes principally from C shaft.

Missouri

ZINC-LEAD DISTRICT

Coahuila Lead and Zinc Company—This company has let the contract for a 300-ton mill on its 40-acre lease of the Horton land at Porto Rico. Seven drill holes show an 8- to 10-ft. face of sheet ore at 200 ft. depth. The double compartment shaft is nearly into the ore and will be equipped with skips instead of cans.

Lone Star—C. W. Eastwood and C. J. Tobias have purchased a half interest in the 10-acre lease, north of Knights station, from H. T. Keltner. Three shafts are in ore.

Pittsfield—This company has just completed sinking a second shaft to the ore on its lease south of Prosperity. The company has a 10-acre lease and a 150-ton mill and is mining sheet ore at 180 ft. depth.

Tenderfoot—This company is overhauling its mill and installing new equipment preparatory to starting up. The Tenderfoot is operating on the land of the New York & St. Louis Mining Company, at Porto Rico.

Wolfsheart—This company, on the Jasper County Royalty Company's land near Duenweg, has opened up 9 ft. of rich sheet ore in the shaft at 232 ft. depth. A large mill will be erected.

Montana

BUTTE DISTRICT

East Butte—The annual meeting of stockholders, after several postponements, was finally held on July 8 at Butte. Robert H. Gross, William F. Everts and Frank P. Son, all of Boston, were elected to succeed Patrick Wall and James Talbott, resigned, and Henry Mueller, deceased. It was further decided to remove the principal offices of the company to Boston, where the future meetings will be held. The choice of president to succeed Frank Sullivan, of Butte, will be determined at the first meeting of the new board of directors soon to be held in Boston. With the change in management of the company and its control by Boston stockholders, chief among whom is W. A. Paine of the brokerage concern of Paine, Webber & Co., it is expected that active operations upon the company's properties will soon be resumed.

North Butte Extension—It is reported that the financial troubles of the company, which led recently to several attachments of the company's claims, will soon be settled. A Chicago attorney, representing the interests of stockholders of that city, was in Butte several days during the past week and has since returned to report upon conditions. The indebtedness, so far as made public, amounts to some $18,000.

Montana Gold Mountain Mining Company—The trial of an action against the company for the purpose of foreclosing several mechanic's liens on the company's mill at German gulch is now in progress before the local district court. The amount involved is in the neighborhood of $3000.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Ore Shipments—The total production for the week ended July 2 was as follows: The Nevada-Goldfield Reduction Works handled from the Little Florence 20 tons; Sandstorm No. 5, 25; Commonwealth, 25; Hays-Curtis, 30; Black Butte, 15; Mohawk Combination, 27. The Western Ore Purchasing Company handled from the Gem 27 tons; Baby Florence, 27; Van Riper, 90; Nevada Lease, 21; Rogers Syndicate, 492; Engineers' Lease, 187; Mushett, 72. In addition 15 tons were received from Hornsilver. Total, 1073 tons.

ESMERALDA COUNTY—HAWTHORNE

Big Injun—This mine, about 10 miles from Hawthorne and close to the old Bodie stage road, was sold by the United States marshall this week. The sale was for the purpose of quieting title to the property. The mine was discovered by Mexicans some 30 years ago and produced considerable gold from high-grade streaks, no attention being paid to low-grade ore. About two years ago a 10-stamp mill and an aërial tram half a mile long were constructed, but owing to financial dissension among the stockholders the machinery was never started. The sale of property by the court clears the situation, and the property is to be started up.

NYE COUNTY—BELLEHELEN

A 50-h.p. hoist and a seven-drill compressor have been shipped to the Brannick & Sweer property, just purchased by Denver parties for $60,000, 25 per cent. cash and the balance payable in September. Bellehelen is 65 miles in a straight line—about 100 by road—northeast of Goldfield, and about 50 miles east of Tonopah.

NYE COUNTY—TONOPAH

Ore Shipments—The ore shipments over the Tonopah & Goldfield railroad for the week ended July 2 to the Western Ore Purchasing Company, consisted of 130 tons from the Tonopah Extension. The Tonopah company sent 3460 tons, the Belmont company 750 tons, the Montana-Tonopah 1100 tons, the North Star 80 tons, the Midway 100 tons, and the MacNamara 150 tons to the mills, making the total shipments for week 5770 tons.

MacNamara—Owing to litigation with the West End, this company has only a limited area in which to work; but from a block of ground about 100 ft. long in the westerly end of the 300-ft. level it shipped last week 150 tons of ore worth above $50 per ton.

Montana-Tonopah—The mill with 40

stamps is treating regularly 1100 tons of ore per week, making a recovery of 91 per cent.

Tonopah-Belmont—Prospecting along the Mizpah fault on the 1000-ft. level continues with promising results. The Belmont shipped 700 tons during the week.

Tonopah Extension—Three raises will be put up from the 600 to the 500 level for mining and ventilation purposes. Gases impede the work on the 600 level.

Tonopah Mining Company—This company last week broke 187 ft. of new ground in the Silver Top claim and 214 ft. in the Mizpah claims, besides shipping 3550 tons of ore. Hereafter this mine will work only six days per week, closing on Sundays.

WHITE PINE COUNTY—ELY

It is reported that the Nevada Northern railway will be extended from Ely to Pioche.

Steptoe—The first unit of the mill is said to be giving a capacity of 1500 tons per day, instead of 1300 tons estimated. The second unit will be started about July 15, and the third unit toward the end of August. The mill is said to be showing an extraction of nearly 75 per cent. of the mineral. The smelter has been put in operation.

Giroux Consolidated—Two hundred men will be employed two months on the long pipe-line from Steptoe Valley to the concentrator at Kimberley. Foundations for the boilers and pumping machinery are about completed.

Oklahoma

OTTAWA COUNTY

Kenwood—This company is preparing to build a concentrating mill on its Index lease at Miami.

King Jack—Developments at this mine, near Miami, have been so good that the owners, Chapman & Lennan, have decided to build a mill at once.

Southern Queen—This company's concentrating mill at Miami is nearly completed.

Pennsylvania

The Greene county court has practically decided that in Pennsylvania, county assessors have no right to assess land for values that may be below the surface. The decision, if upheld by the higher court, will have the effect of lowering the assessed valuation of coal lands throughout the State. The case on which the decision was rendered was an appeal from the valuation fixed by the county commissioners on land of T. A. Adamson. Adamson owns 77 acres in Franklin township. In the triennial assessment the assessors of Franklin township placed the value of the coal at $100 an acre. Adamson's farm was assessed at $200 an acre. Farms under which the coal had been sold were assessed at $100 and even lower. Later the county commissioners lowered the assessed value of Franklin township coal $50 an acre, reducing Adamson's assessment to $150. Adamson appealed. His attorney maintained the farm should not be assessed any higher, although the coal had not been sold, than neighboring farms, where the coal had been severed from the surface. The court concurred in this view and lowered the assessed value of the property to $100 an acre. It is understood the county commissioners will appeal the case.

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—This company's statement for May and the 11 months of its fiscal year from July 1 to May 31 is as follows:

	May.	Eleven Mos.
Earnings	$3,075,764	$35,937,336
Expenses	2,901,967	33,502,846
Net earnings	$ 173,797	$ 2,434,490

For the 11 months there were increases of $519,317 in earnings; of $14,662 in expenses; and of $504,655 in net earnings.

BITUMINOUS COAL

Merchants Coal Company—A controlling interest in this company at Boswell, near Johnstown, has been sold to the United Coal Company, of Pittsburg. The latter is said to have paid $200 per share for the stock, which is $100 par value. The company has $1,000,000 bonds outstanding and $1,000,000 stock.

South Dakota

LAWRENCE COUNTY

Golden Reward—The Chamberlain filter-press is still operating successfully, and the work of installing more of this type will shortly commence.

Homestake South Extension—The annual meeting to be held here July 14 may decide the question of a mill and the installation of electric machinery. Over 2000 ft. of drift work has been accomplished on the 150-ft. level.

PENNINGTON COUNTY

Golden Slipper—The old ledge has been found during some prospecting work and shows well at a depth of 15 ft. in a new shaft. Operations are to be continued.

Golden West—Discovery of a new ledge of unknown quality has caused the management to order the use of a diamond drill to a depth of 500 ft. The new ledge is said to be richer than the old ones.

Provident—The Tykoon mill is being overhauled and some tests on bismuth ore from the mine are to be made, which if successful will mean the continued running of the mill.

Standby—It is expected to have the repairs on the mill and about the property in shape to commence treating ore in August. Work on the new 100-stamp mill will be commenced before that date.

Utah

BEAVER COUNTY

Majestic Copper Mines Company—It comes from a reliable source that this company's smelter, near Milford, is about to be leased to a syndicate of Utah and Nevada mineowners who propose to install additional equipment and operate it as an independent custom plant. It is equipped with one lead stack and one copper-matting furnace. The copper furnace has been in use, but the lead stack is new.

JUAB COUNTY

July 24 has been set as the date for blowing-in the new Tintic smelter in the Tintic district, that day being the sixty-first anniversary of the landing of the Mormon pioneers in Utah. Mormon capital being identified with the enterprise it was decided to plan an extraordinary program for the occasion.

Black Dragon—This mine and some adjoining claims in the Tintic district have been sold to Jesse Knight, of Provo, Utah.

Godiva—At a special meeting of shareholders of this company, operating in the Tintic district, the capital stock was increased from 100,000 to 1,000,000 shares. Following the plan adopted by other companies in the district, the mine is to be exploited at greater depth and the shaft is to be continued to 1200 ft. The Godiva is one of the oldest producing mines in Utah and at one time occupied a place in the front ranks. Although dividends were earned the exact amount has never been made public, the stock being in few hands.

SALT LAKE COUNTY

Silver King—This group, at Alta, has been purchased by a Salt Lake syndicate, who will shortly begin development.

SUMMIT COUNTY

American Flag—At a special meeting of shareholders on July 11, this company, operating at Park City, authorized the issue of $150,000 in bonds, the proceeds to be applied toward providing milling facilities.

Nelson-Queen—The new mine equipment ordered for this property recently is being installed.

Washington

The report of D. C. Botting, State mine inspector, for the year 1907 gives the coal production by counties as follows, in short tons: Kittitas, 1,523,618; King, 1,446,602; Pierce, 612,037; Lewis, 100,982; Thurston, 25,772; Whatcom, 3161; total, 3,712,172 tons, being 419,074 tons more than in 1906. The coke made was 49,797 tons, a decrease of 9619 tons. Shipments by water from the port of Seattle in 1907 were 539,380 tons; from Tacoma, 134,711 tons.

West Virginia

HARRISON COUNTY

Haywood Coal Mining Company—This company has nearly completed its mining plant at Shinnston, and will soon begin to take out coal. The main office is at Pittsburg, Penn., with a branch office at Fairmont, W. Va. The capacity of the plant is 500 tons per day. Officers of the company are E. F. Gwynn, president; Seymour McIntire, vice-president; H. H. Myers, secretary; P. M. Chidester, treasurer; R. S. Monroe, general manager.

Wisconsin

ZINC-LEAD DISTRICT

D. D. C.—The sale of the D. D. C. mine at Rewey was consummated July 9. O. S. and W. H. Picher, of the Picher Lead Company, together with Cincinnati parties, made the purchase. Consideration is not made public. The mining lease covers 160 acres; about 150 ft. of underground drift are opened up showing good disseminated ore, both jack and lead. A 50-ton mill is now in course of construction but enlargement will be made to 100 tons capacity. Other properties are being considered and those taken over will be controlled by the Joplin Ore Separating Company at Galena, Ill., a steady source of ore supply being thus assured for the big roasting plant.

Wisconsin Zinc Company—The consolidation of the mining properties at Platteville, previously mentioned in these columns, was permanently effected this week. The new company will be known as the Wisconsin Zinc Company and is incorporated under the laws of Maine with a capitalization of $1,000,000. The mines taken over are the Royal, Acme, Empire and Mitchell Hollow. These properties lie in one contiguous group and can be handled advantageously by one management. Work has already been started at the Acme and Empire plants on improvements. It is the intention to operate these mills double shift instead of one shift per day as formerly. Work will be started at once also at both the Royal and Mitchell Hollow.

The Wisconsin Zinc Company will not take over the electrostatic separator at Platteville as was erroneously reported. Its officers are H. S. Kimball, president, Fred Krog and F. W. Rogers, vice-presidents; C. W. Landrum, general manager.

Philippine Islands

Benguet Consolidated Gold Mining Company—This company's production from its mine in Benguet is reported at 358 oz. gold, or $7400, in April.

East Batan Coal Mines—The *Far Eastern Review*, of Manila, says: "The announcement is made by A. M. Betts, manager of the company, that over 80,000 tons of coal have been blocked out and a 30-h.p. engine is being installed to supply power for the cable which carries the product to the wharf from the interior of the mines. The output daily, heretofore, has been about 60 tons but this will be greatly increased with the installation of the machinery now under way."

Paracale Gold Dredging Company—This company reports the saving of gold from its dredge on the Paracale river at 1.73 oz., or $3576, in April.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for week ending July 4 were as follows: City of Cobalt, 46,870 lb.; La Rose, 62,240; McKinley-Darragh, 120,000; Nipissing, 111,340; O'Brien, 212,730; Townsite, 45,600; Temiskaming, 100,000; Hudson Bay, 60,000; Tretheway, 108,180; total, 866,960 pounds.

Cobalt Lake—Development is being steadily pushed with very favorable results; the silver taken out in shafting operations is sufficient to meet the entire expenditure. The plan of operations contemplates a network of tunnels beneath the lake. Five shafts have been sunk, two of them for ventilation. Tunnels have been run from the main shaft for 476 ft. to the north on the east side of the lake and 609 ft. to the south. Some promising veins have been encountered, including a 36-in. vein opposite No. 3 shaft. The company has ore valued at $50,000 ready for shipment.

Crown Reserve—A new vein 10 in. wide which carries considerable silver was found recently in crosscutting at 50-ft. level of No. 1 shaft. The vein runs parallel to the main vein about 5 ft. distant.

Coniagas—The concentrating plant is being improved; 30 stamps are being put in to replace the ball mill and Huntingdon mill now in use for fine grinding.

Silver Queen—The power house containing a 12-drill compressor and three 80-h.p. boilers was destroyed by fire on July 12. The building is a total loss and the equipment was partially destroyed.

Mexico

GUANAJUATO

The Mexican Central Railroad completed the extension of its road into the City of Guanajuato and established its terminal there on June 9 and regular scheduled trains are now leaving and arriving daily. This extension connects the City of Guanajuato with the main line of the Mexican Central at Silao. The Mexican Milling and Transportation Company's 36 miles of broad-gage railroad, now nearing completion, will within a short time receive freight from the Mexican Central road at the station and make delivery to any property in the district without transfer. This will effect a great saving in time and cost of transportation of ores and other classes of freight between the numerous properties in the district, as well as freight coming into the district from outside sources. Two Shay geared locomotives have arrived at the Tepetapa station for the mineral belt railroad. The locomotives are 60 ft. long, they weigh 110,800 lb. and have six wheels to the side, all of the wheels drivers, being connected by gears to the driving shaft.

Africa

TRANSVAAL

The gold output for June is reported by cable at 574,973 oz. fine, which is 8019 oz. less than in May, but 67,414 oz. more than in June, 1907. The decrease from May was due entirely to the shorter month, the daily average for June having been 19,166 oz., and in May 18,774 oz. For the six months ended June 30 the total was 3,138,732 oz. in 1907, and 3,399,957 oz.—or $70,277,111—in 1908; an increase of 261,225 oz. this year.

Australia

WESTERN AUSTRALIA

Gold production in June is cabled at 136,708 oz., an increase of 2753 oz. over May, and of 186 oz. over June, 1907. For the six months ended June 30 the total was 838,255 oz. in 1907, and 827,019 oz.—or $17,094,483—in 1908; a decrease of 11,236 oz. this year.

New Caledonia

Shipments of ores from the colony are reported by the *Bulletin du Commerce*, of Noumea, as follows, in metric tons:

	April.	Four Mos.
Nickel ore	.....	27,518
Cobalt ore	282	1,312
Copper ore	3	3
Chrome ore	53	5,945

No nickel ore was reported for April, an unusual occurrence.

New Zealand

The Mines Department reports the exports of gold for the three months ended March 31 at 118,119 oz. bullion in 1907, and 134,100 oz. in 1908; an increase of 15,981 oz. The bullion reported this year was equal to $2,569,936, or 124,332 oz. fine gold.

Exports of silver in March were 101,550 oz. in 1907, and 89,038 oz. in 1908; a decrease of 12,512 oz. this year.

South America

BRITISH GUIANA

Exports of gold for the five months ended June 1 were 25,397 oz. bullion in 1907, and 24,912 oz. in 1908; a decrease of 485 oz. The bullion reported this year was equal to $435,462, or 21,068 oz. fine gold.

Diamond exports for the five months were 1193 carats, valued at $8154; an increase of 143 carats over last year.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 15—Coal trade in the West is again showing a slight improvement. It is slow, but there is no change for the worse. More steam coal is called for, and the mines are making rather better time. The Lake trade is increasing slowly.

The bituminous trade in the East is dull, with small sales and a continued light demand for steam coal. The anthracite trade is a little better, but the companies are reported to be curtailing production, as stocks at storage points are heavy. The seaboard trade is the lightest known for several years.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to July 4, in short tons:

	1907.	1908.	Changes.
Anthracite	2,899,845	2,753,037	D. 146,808
Bituminous	19,269,270	16,267,127	D. 3,002,143
Coke	7,211,513	3,418,434	D. 3,793,079
Total	29,380,628	22,438,598	D. 6,942,030

Total decrease this year to date was 23.6 per cent.

Coal passing through the Sault Ste. Marie canals for the season to July 1, short tons:

	1907.	1908.	Changes.
Anthracite	435,940	364,914	D. 71,026
Bituminous	3,305,572	1,396,961	D. 1,908,611
Total	3,741,512	1,761,875	D. 1,979,637

The total decrease, which was chiefly in bituminous coal, was 52.9 per cent.

Anthracite coal shipments in June are reported at 5,704,852 tons, a decrease of 272,054 tons from June, 1907. For the six months ended June 30 the shipments were, in long tons:

	1907.	1908.	Changes.
Reading	6,751,398	6,080,172	D. 671,226
Lehigh Valley	5,582,314	5,657,264	I. 74,950
N. J. Central	4,311,696	4,327,781	I. 16,085
Lackawanna	5,153,251	5,051,814	D. 101,437
Del. & Hudson	3,208,177	3,275,120	I. 66,943
Pennsylvania	3,044,026	3,105,226	I. 61,200
Erie	3,535,577	3,723,436	I. 187,859
N. Y., Ont. & Western	1,350,802	1,447,629	I. 96,827
Total	32,937,241	32,668,442	D. 268,799

The total decrease this year was 0.8 per cent. The Philadelphia & Reading shows a considerable decrease and the Delaware, Lackawanna & Western a small one. All the other companies report increases, the largest actual gain being on the Erie, and the largest proportional one on the New York, Ontario & Western.

Anthracite shipments by Lake from Buffalo for the season to July 1 were 1,034,170 tons in 1907, and 1,073,110 in 1908; an increase of 38,940 tons.

Coal and coke tonnage, Chesapeake & Ohio Railway, 11 months of fiscal year from July 1 to May 31, short tons:

	Coal.	Coke.	Total.
New River	5,179,340	187,851	5,367,191
Kanawha	4,117,164	77,936	4,195,100
Kentucky	245,343	.....	245,343
Connecting lines	157,773	50,679	208,452
Total	9,699,620	316,466	10,016,086
Total, 1907	8,981,269	415,089	9,396,358

Deliveries this year to points west of mines, 4,731,029 tons coal and 194,825 coke; points east, 1,445,378 tons coal and 121,641 coke; tidewater, 3,500,929 tons coal. Anthracite delivered to line points, 21,784 tons.

Coal receipts at Boston, six months ended June 30, reported by Chamber of Commerce, in long tons:

	1907.	1908.	Changes.
Anthracite	1,027,672	882,058	D. 145,614
Bituminous	1,515,777	1,522,880	I. 7,103
Total domestic	2,543,449	2,404,938	D. 138,511
Foreign	275,105	223,950	D. 51,155
Total	2,818,554	2,628,888	D. 189,666

The foreign coal comes chiefly from Nova Scotia.

New York

Anthracite

July 15—Prepared sizes are easy and in light demand. Small steam sizes are in slightly better demand, owing to the curtailment of production. All sizes are being sold below circular prices and prepared sizes are quoted at about the April schedule. The large producers, however, are not offering coal below schedule.

Prices are as follows: Broken, $4.55; egg, stove and chestnut, $4.80; pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

The soft-coal market remains in the same lifeless condition that has existed for so many weeks. There is no disposition on the part of consumers to take on coal and production has been reduced to the lowest point. In New York harbor good grades of steam coal are offered at $2.45@2.50 with no takers. Poorer grades fetch as low as $2.25 per ton.

Transportation from mines to tide is up to all requirements. Many cars are idle and in need of repair, but the railroads are making no attempts to put them in condition. In the Coastwise vessel trade, captains are anxious to charter even at the low rates prevailing, but little business is being done. Freight rates are unchanged, as follows: To Boston, Salem and Portland, 50@55c.; Lynn, 55@60c.; Saco, 90c.; Newburyport, 75c.; Portsmouth, 55@60c.; Bath, 60@65c.; Gardiner, 65c.; Bangor, 70@75c.; to the Sound, 45@50c.; towages where usual.

Birmingham

July 13—Coal operations in Alabama have been interfered with some by the strike of the union miners. Quite a number of non-union men at work quit and joined the union. The mines are still running, though at some places the output is slack. Deputies are being sent to some of the collieries to prevent any possible interference. While there are no indications of trouble, this is being done as a matter of precaution. The demand for coal is looking up a little. The coke ovens are demanding a good quantity. The coke consumption is healthy as the iron production improves. The coal operators in this section do not look for much of a fight on the part of the union men as their ranks are down to the lowest number in years.

Chicago

July 14—Conditions in the coal market continue bad for the producer. Summer demand is light and runs to Western fine coals. Neither country nor city dealers will stock up on prepared sizes and large consumers find little use for such sizes. Anthracite business is almost at a standstill. There is much demurrage coal on tracks and shipments should be curtailed from western and eastern mines.

Illinois and Indiana lump or egg runs $1.65@2.15; run-of-mine, $1.50@1.75; screenings $1.45@1.65. Lump is very weak, quotations being merely nominal.

Eastern coals continue weak. Hocking and smokeless are 15@25c. under circular prices, much Hocking being obtainable at $3. Youghiogheny on contracts is unchanged.

The harvesting trade has already begun, but is not yet heavy.

Pittsburg

July 14—The coal trade shows no improvement, but operators continue to quote $1.15 for mine-run coal on contract and 5c. more on transient business. Slack continues to be a drug, and can be had as

low as 40c., although some producers still quote 75c. About 90 per cent. of the railroad mines are running steadily, the product going to the Lake ports. There is plenty of railroad cars. The river mines continue to operate in full, and when the rivers are again navigable there will be an unusually large shipment to the Southern ports.

Connellsville Coke—Prices remain unchanged, furnace coke $1.65@1.75 and foundry $2.10@2.25 at ovens. The H. C. Frick Coke Company fired 500 idle ovens yesterday. The *Courier*, in its weekly report, gives the production in both regions at 165,472 tons. The shipments were 6449 cars as follows: To Pittsburg, 2793; to points west of Connellsville, 3250; to points east of Connellsville, 406 cars.

San Francisco

July 8—On July 1 coal at the wharves in this city was reduced, wholesale, from $12 to $9 per ton, and a reduction in retail prices will follow. This reduction is expected to be permanent as the British Columbia mines are now in a position to supply the needs of this city without Australian imports. The reduced price has stimulated the demand for coal. Very little coal is now being produced in California, shipments from the Mount Diablo mines having fallen off materially since the use of fuel oil became common. The Stone Cañon coal mines in Monterey county are being extensively developed and a branch railroad to the Southern Pacific line is projected. This coal is of a better quality than that heretofore mined in this State. The output of these properties will before long be marketed in San Francisco and will have an important bearing on the local fuel supply. The Controller Bay, Alaska, coalfield will also be developed soon. The Alaska Petroleum and Coal Company owning mines in the Behring Lake coalfield, near Catalla, expects to secure the construction of a railroad line from Catalla to Behring Lake. There is reason to expect a supply from Alaska in another year.

Foreign Coal Trade

German Coal Trade—Imports and exports of fuel in Germany, five months ended May 31, metric tons:

Imports:	1907.	1908.	Changes.
Coal	4,485,581	4,437,176	D. 48,405
Brown coal	3,541,673	3,724,952	I. 183,279
Total coal	8,027,254	8,162,128	I. 134,874
Coke	184,174	207,486	I. 23,314
Briquets	65,845	76,690	I. 10,845
Exports:			
Coal	7,949,197	8,200,114	I. 250,917
Brown coal	7,597	10,949	I. 3,352
Total coal	7,956,794	8,211,063	I. 254,269
Coke	1,505,452	1,540,571	I. 35,119
Briquets	484,997	678,977	I. 193,980

Coke exports this year included 8327 tons to the United States. Imports of peat fuel this year, 5138 tons; exports, 9296 tons.

Iron Trade Review

New York, July 15—The iron market continues dull and quiet. There has been moderate pig-iron trading, and furnaces seem disposed to make concessions still for good orders. Foundry iron supplies most business, though there is some call for basic pig.

In finished material there is little new business. A good deal of structural work is talked about, but does not reach the contract stage. Some contracting concerns complain that the manufacturing companies are offering to take structural orders at prices which erectors who have to buy their material cannot meet.

Pig Iron Production—The monthly reports from the furnaces show a slight improvement. On July 1 there were 151 coke and anthracite furnaces in blast, having a total weekly capacity of 264,500 tons. This is an increase of 4000 tons over June 1; but a decrease of 263,500 tons from July 1, 1907. Taking the estimate of the *Iron Age* and making allowance for the charcoal furnaces, the production of pig iron in June was 1,108,500 long tons; for the six months ended June 30 it was 6,866,600 tons. This estimate compares with 13,478,044 tons in the first half of 1907; a decrease of 6,611,444 tons, or 47.6 per cent. This is the sharpest reduction on record.

Lake Superior Iron Ore—Shipments of iron ore by lake from the Lake Superior region for the season up to July 1 are reported by the Cleveland *Iron Trade Review* as follows, in long tons:

	1907.	1908.	Changes.
Escanaba	1,824,215	260,741	D. 1,563,474
Marquette	769,059	119,014	D. 650,045
Ashland	1,049,357	271,577	D. 777,780
Superior	2,318,911	478,633	D. 1,840,278
Duluth	4,094,046	1,164,809	D. 2,829,237
Two Harbors	2,630,036	566,193	D. 2,063,843
Tota	12,685,624	2,860,967	D. 9,724,657

Total decrease this year, 76.7 per cent. This was pretty evenly distributed over all the ranges.

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for May, and the five months ended May 31, are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1907.	1908.	Changes.
May	$14,594,043	$11,281,425	D.$3,312,618
Five months	76,965,500	69,627,731	D. 7,337,769

Leading items of export for the five months, in long tons:

	1907.	1908.	Changes.
Pig Iron	35,688	15,524	D. 20,164
Billets, ingots & blooms	47,033	58,158	I. 11,125
Bars	39,480	23,083	D. 16,397
Rails	124,731	67,680	D. 57,051
Sheets and plates	57,157	40,594	D. 16,563
Structural steel	54,228	52,371	D. 1,857
Wire	63,698	61,454	D. 2,244
Nails and spikes	23,666	18,200	D. 5,466

Decreases are shown in all items except billets, ingots and blooms.

Iron and Steel Imports—Imports of iron and steel, including machinery, from the United States for May and the five months ended May 31 are valued as follows:

	1907.	1908.	Changes.
May	$4,520,103	$1,347,332	D. $3,172,771
Five months	18,262,387	8,442,235	D. 9,820,152

Leading items of import for the five months, in long tons:

	1907.	1908.	Changes.
Pig iron	282,249	44,210	D. 238,039
Scrap	8,531	1,621	D. 6,910
Ingots, blooms, etc.	6,899	3,857	D. 3,042
Bars	12,635	11,057	D. 1,578
Wire-rods	7,440	4,428	D. 3,012
Tin-plates	26,991	28,479	I. 1,288

The only increase shown here was a small one in tinplates.

Birmingham

July 13—While the Southern pig-iron market is yet quiet, the furnace people appear to be satisfied. The production of iron in the Birmingham district may be delayed a little by the strike of the union coal miners, that is as far as an increased production goes. The shipments of pig iron are healthy. There is practically no iron on furnace yards in the immediate Birmingham district, though in the outlying territory, in Alabama, there is yet more than 50,000 tons. The quotations are firm above $12 per ton, No. 2 foundry. There is a denial that some iron was sold here at $11.50 or $11.75 No. 2 foundry basis.

Chicago

July 14—Aside from a few contracts from agricultural manufacturing establishments the pig-iron market continues quiet. Southern iron is weaker, selling at $12 for No. 2 Birmingham, openly, with reports of $11.50 Birmingham ($15.85 Chicago) common. There is said to be a heavy demand for Northern for implement purposes, charcoal iron being especially in demand. Northern No. 2 coke is quoted at $17.25@17.75, with charcoal iron at $20@20.50, for second-half delivery. Lots that must be moved quickly bring the lowest prices.

Sales of iron and steel products are in general dull. The tendency among consumers continues to go cautiously. Coke is somewhat dull at $4.90 for the best Connellsville.

Philadelphia

July 15—In hunting around after encouraging features one small one shows up—the sending in of orders to ship iron on contracts placed some time ago with the condition that the price was to be fixed by the rate prevailing at the time the order to ship was sent in. Apart from this feature there is really nothing deserving of comment this week. Not a single instance of a further cut in prices can be unearthed. In this sense prices are stronger. Very little is being done with reference to fourth-quarter delivery. No. 2X is $16@16.50; forge, $16, and basic about the same.

Steel Billets—Billets continue dull because buyers believe that prices may

weaken and because very little stock is needed.

Scrap—The railroads have plenty of scrap which they hold at prices dealers will not pay. Heavy steel scrap is a accumulating with no buyers in view just now, but dealers know where they can find buyers if they will take buyers' prices—which they do not propose to do.

Pittsburg

July 14—While there has been no marked improvement in conditions, the situation is stronger and the outlook is regarded as brighter than at any time since the opening of the year. Inquiries for steel have been more numerous than for several months, but there is a temporary weakness in iron for prompt delivery. One of the favorable features of the week was the settlement of the wage scale for another year by the Amalgamated Association of Iron, Steel and Tin Workers and the Western Bar Iron Association. The adjustment of the scale was on terms better than had been expected, being a reduction from last year's scale of about 8 per cent. Arrangements are now being made to hold another conference with the Republic Iron and Steel Company. All of the plants of the Republic, 11 in number, are idle.

The talk of shading of steel prices lately is shown to be without foundation as on all inquiries the full prices were named. The railroads in the Pittsburg district are doing more repair work than usual, and it is certain that they soon will be in the market for material. Some fairly good orders for structural material have been placed. The mills in the Pittsburg district are running about the same as a week ago.

Pig Iron—Prices of pig iron for early shipment have slumped, but for fourth-quarter shipment quotations are 25 to 50c. higher. A number of sales of bessemer iron have been made lately at $15.75, Valley furnaces. In foundry iron the drop was greater, one or two sales having been reported at $14.50 at furnace for No. 2 foundry, but the quotation this week for prompt delivery is $14.75. Basic and malleable iron are quoted at $15 at furnace for July delivery, and gray forge is quoted nominally at $14. Of the 19 merchant furnaces in the two valleys nine are running.

Steel—There is more inquiry for billets. The price remains at $25 for both bessemer and open-hearth, with half the freight to destination absorbed by the seller. Plates remain at 1.60c. and steel bars at 1.40c.

Sheets—The market is unchanged. Black sheets are 2.50c. and galvanized 3.55c. for No. 28 gage.

Ferro-manganese—The market continues strong; prompt delivery ferro is $46 @47, Pittsburg.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, July 15.

At all U. S. Ports in May and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1908..	$26,555,913	$ 3,069,402	Exp. $23,486,511
" 1907..	4,505,444	2,682,163	" 1,823,281
Year 1908..	44,891,257	22,926,623	" 21,964,634
" 1907..	12,428,592	19,303,305	Imp. 6,874,713
Silver:			
May 1908..	4,028,334	3,362,176	Exp. 666,158
" 1907..	4,326,216	3,563,096	" 763,120
Year 1908..	21,077,185	17,660,758	" 3,416,427
" 1907..	23,858,610	18,919,065	" 4,939,545

Exports from the port of New York, week ended July 11: Gold, $3000, to the West Indies; silver, $1,404,290, to London and Paris. Imports: Gold, $57,655, from South America; silver, $21,000, from Mexico.

Specie holdings of the leading banks of the world July 11, are reported, as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$301,491,900
England.....	$188,838,040	.....	188,838,040
France.....	633,267,080	$182,914,435	816,181,515
Germany.....	184,345,000	76,395,000	260,740,000
Spain.....	78,230,000	134,135,000	212,365,000
Netherlands....	38,516,000	21,060,500	59,576,500
Belgium.....	20,956,665	10,478,335	31,435,000
Italy.....	180,765,000	21,375,000	202,140,000
Russia.....	561,110,000	38,885,000	599,995,000
Aust.-Hungary.	234,010,000	66,680,000	300,690,000
Sweden.....	19,430,000	.....	19,430,000
Norway.....	8,160,000	.....	8,160,000
Switzerland....	15,550,000	.....	15,550,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Gold and silver movement in France, five months ended May 31:

	Imports.	Exports.	Excess.
Gold....	Fr.395,360,000	F.12,770,000 Imp.	Fr.382,590,000
1907...	95,090,000	73,123,000 Imp.	21,967,000
Silver..	60,140,000	74,250,000 Exp.	14,110,000
1907...	65,313,000	64,325,000 Imp.	988,000

Imports of copper and nickel coins, 40,000 fr. in 1907, and 31,000 fr. in 1908; exports, 150,000 fr. in 1907, and 333,000 fr. this year.

Silver Market

SILVER AND STERLING EXCHANGE.

July.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	July.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
9	4 8700	53⅛	24 1/16	13	4.8705	53⅝	24¾
10	4.8700	53¼	24 1/16	14	4.8705	53⅜	24⅝
11	4.8705	53¼	24 1/16	15	4.8710	53⅜	24⅝

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to July 2:

	1907.	1908.	Changes.
India.....	£6,301,774	£4,158,158	D. £2,143,616
China.....	.....	516,400	I. 516,400
Straits.....	544,012	90,510	D. 453,502
Total.....	£6,845,786	£4,765,068	D. £2,080,718

Imports for the week were £5000 from Argentina, £3000 from Chile and £87,000 from New York; £95,000 in all. Exports were £288,800 to India.

The silver market has been fairly steady the past week, the demand depending on purchases for the Indian bazaars. Although the rainy season in India seems to assure good crops it is not expected that the India mint will be a buyer for several months. The market closes steady at 24 5/8d. in London.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

July.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
9	12¾ @13	12½ @12¾	57⅞	29¼	4.40 @4.45	4.42½ @4.47½	4.27½ @4 32½
10	12¾ @13	12½ @12¾	57⅝	28¾	4.40 @4.45	4.42½ @4.47½	4.27½ @4 32½
11	12¾ @13	12½ @12¾	....	28¾	4.40 @4.45	4.40 @4.45	4.27½ @4.30
13	12¾ @13	12½ @12¾	57¾	28½	4.40 @4.45	4.40 @4.45	4.27½ @4 30
14	12¾ @13	12½ @12¾	57½	28½	4.40 @4 45	4.40 @4.45	4.27½ @4.30
15	12¾ @13	12½ @12¾	57¾	29¼	4.40 @4.45	4.40 @4 45	4.27½ @4.30

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The general position of the market is materially strengthened through the increase in the legitimate requirements of the American consumers, which is steadily reflected in a continuous demand. As a result some business is transacted from day to day, and as Europe is also participating in the purchases, the quantities taken for home trade and for export show more and more approach to a normal situation. Producers, as a general rule, are pursuing the policy of meeting the market from day to day, and prices on this account have hardly been affected as yet, but the close is steady at 12¾@13c. for Lake copper, and 12½@12¾c. for electrolytic in ingots, cakes and wirebars. The average of the week for casting copper is 12⅜@12½ cents.

The better tendency in the standard market in London is largely due to a revival in the consumptive demand, which for a short time had been rather discouraging. Prices were well sustained throughout the week and close firm at £57 15s. for spot, £58 7s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £60@61; best selected, £60@61; strong sheets, £72@73.

Tin—The London market, while fluctuating almost daily, has in the main maintained its firm tone, and the close is cabled at £132 5s. for spot, £133 7s. 6d. for three months.

American consumers do not put much faith in the London market and are hold-

ing aloof so far as future business is concerned. Spot metal is held at a premium, and quotations at the close are made at about 29¼ cents.

Lead—As is not unusual during the midsummer season, business in this metal is quiet. The floating supply—that is, the quantities in second hands—is still fairly large, and under the effort to realize of those who have missed the market, prices have given way slightly, and the close is weak at 4.40@4.45c. New York.

The position of the lead market abroad is righting itself. Consumers at last recognize the abnormally low level at which this metal has been ruling, and have taken hold more freely. Quotations in consequence have advanced to £13 for Spanish lead, £13 2s. 6d. for English lead.

Spelter—The market for this metal is neglected. Nothing of importance transpired during the week, and the close is uncertain at 4.27½@4.30c. St. Louis, 4.40@4.45c. New York.

From London, the reports are more encouraging. Production is beginning to suffer under the low prices which have ruled in Europe for such a long time, and stocks having been thoroughly liquidated, it did not take much of a demand to stiffen prices. The close is firm at £19 for good ordinaries, £19 5s. for specials in London.

The Lanyon-Starr Smelting Company will hold its annual meeting Aug. 11. Owing to the continued depression in the spelter market the dividend due July 15 has been passed.

Zinc Sheets—Base price is 7c., f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—No sales were made during the week. Quotations remain nominal at 8⅝@8¾c. for Cookson's, 8¼@8½c. for Hallett's and 8@8¼c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $44 per flask for large lots; $45 for jobbing orders. San Francisco, large lots nominal at $43.50, domestic and $42, export; small orders, $45@46. London is £8 per flask, with £7 17s. 6d. quoted by second hands.

Platinum—Prices remain unchanged at $23.50 per oz. for hard platinum, $21 for ordinary, and $16 for scrap.

German Copper Imports and Exports

Imports and exports of copper in Germany for the five months ended May 31, metric tons:

	1907.	1908.	Changes.
Imports	51,481	72,247	I. 20,766
Exports	3,502	3,354	D. 148
Excess, imports	47,979	68,893	I. 20,914

The large increase in net imports is probably due, not to increased consumption, but to the carrying of much larger stocks by manufacturers who bought metal at low prices. Exports of copper from the United States to Germany and Holland for the five months were 34,846 long tons in 1907, and 62,235 in 1908; an increase of 27,389 tons. Copper reported on our returns for Holland is included because nearly all of the metal shipped here to Rotterdam and Antwerp is intended for Germany. Approximately 90 per cent. of the German imports this year were from the United States.

Missouri Ore Market

Joplin, Mo., July 11—The highest price paid for zinc was $38; the assay base price was $35.50, ranging down to $30 per ton for sludge ores; the average price all grades was $32.30, an advance of $1 on account of very small silicate sales. The highest price paid for lead ore was $64 on purchases of the previous week, the high offering of this week being $61, medium grades selling at $58@60; the average price, all grades, is $60 per ton.

The large increase of production from the Oklahoma mines at Miami, and the resumption of operations by a number of mines temporarily closed down, raised the production of the week.

Following are the shipments of zinc and lead from the district for the week ending July 11:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,062,470	931,180	$76,933
Joplin	1,576,940	274,010	34,635
Badger	969, 30	34,080	17,497
Miami	853,910	84,350	14,841
Galena	705,530	83,9?0	13,806
Duenweg	572,630	39,970	10,3?0
Alba-Neck	473,78?	12,5?0	8,430
Granby	127,?00	25,7?0	3,450
Spurgeon	83,860	71,310	2,9?4
Carthage	150,84?	.....	2,649
Aurora	135,940	.....	2,175
Zincite-Sherwood	114,?70	5,100	1,987
Carl Junction	131,840	.....	1,977
Sarcoxie	74,600	.....	1,?93
Playter	41,?90	3,500	772
Cave Springs	16,810	11,220	604
Totals	9,091,?40	1,577,?30	$194,238
28 weeks	257,102,950	40,259,460	$5,443,831

Zinc value, the week, $146,904; 28 weeks, $4,357,525
Lead value, the week, 47,334; 28 weeks, 1,086,306

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1907.	1908.	Month.	1907.	1908.
January	45.84	35.56	January	83.58	46.88
February	47.11	34.92	February	84.58	49.72
March	48.66	34.19	March	82.75	49.90
April	48.24	34.08	April	79.76	52.47
May	45.98	33.39	May	79.56	56.05
June	44.82	32.07	June	73.66	60.48
July	45.79	.....	July	58.18	.....
August	43.22	.....	August	59.54	.....
September	40.11	.....	September	53.82	.....
October	39.83	.....	October	51.40	.....
November	35.19	.....	November	43.40	.....
December	30.87	.....	December	37.71	.....
Year	43.68	.....	Year	68.90	.....

Wisconsin Ore Market

Platteville, Wis., July 11—The base price for 60 per cent. zinc ore this week was $33@35 per ton. Lead ore, best grade, $63 per ton.

Shipments, week ended July 11:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Highland	351,400	106,800	.....
Hazel Green	339,200	80,?00	.....
Benton	27?,030	84,950	.....
Galena	264,000	.....	.....
Platteville	256,170	.....	75,600
Strawbridge	154,000	.....	.....
Dodgeville	150,000	.....	.....
Linden	133,450	.....	.....
Mineral Point	108,600	60,?00	.....
Days Siding	80,000	.....	.....
Livingston	60,000	.....	.....
Rewey	59,000	.....	.....
Elmo	50,300	.....	.....
Total	2,279,150	331,750	75,600
Year to July 11	47,107,465	5,674,165	384,265

In addition to the above there was shipped to the electrostatic separator at Platteville, from Benton, 168,150 lb.; to the Joplin Separator works at Galena, from Benton, 62,300 lb.; and to the Enterprise roaster at Platteville, from Strawbridge, 169,800 lb. zinc ore.

Hazel Green shipped last week—not reported July 4—763,650 lb. zinc ore and 72,400 lb. lead; Linden likewise shipped 40,390 lb. and Mineral Point 154,810 lb. zinc ore not reported last week.

Chemicals

New York, July 15—Few inquiries are received by dealers and the market has settled down to midsummer dullness.

Copper Sulphate—Some sales have been recorded. Some odd lots have been disposed of by independent dealers at cut prices. Quotations are unchanged at $4.65 per 100 lb. for carloads and $4.90 for smaller lots.

Nitrate of Soda—W. Montgomery & Co., Ltd., report shipments from South America to all parts, for the six months ending June 30 at 966,000 tons against 738,000 tons in 1907. The consumption in Europe during this period was 1,025,000 tons and in the United States, 318,000 tons. Quotations for spot 95 per cent. are 2.30@2.32½c. while for other positions of 1908 the price varies from 2.25 to 2.35c. according to quantity and terms of sale.

Phosphates—Paul C. Trenholm reports shipments of phosphate rock from Charleston, S. C., in June at 5500 long tons, all by rail. No coastwise shipments.

Mining Stocks

New York, July 15—The general stock market has been rather stronger, but without great fluctuations and with no serious tendency in either direction. The price level, however, is higher on the whole than a week ago.

The curb market has been dull, with no sensational changes. Copper stocks were only in moderate demand, but prices were generally well maintained.

Boston

July 14—Copper mining shares are on the mend and sentiment is improving. The continued strength of the Butte, or so called Cole-Ryan stocks, has inspired confidence and the good feeling is spreading. North Butte, Butte Coalition and Amalgamated Copper have been the features during the week. North Butte has been steadily bought and has advanced $3.50 to $73.25. A few months ago this stock sold as low as $30 per share. Butte Coalition has risen $2.50 to $25. Amalgamated crossed $70 last week, fell back to $68, and closed at $69.75 tonight.

A favorable feature in the situation is the large increase in the number of stockholders of the leading issues which makes the offerings limited. Arizona Commercial closed strong at $16.37½ tonight. This company is to issue $600,000 in 6-per cent. bonds convertible into stock at $25. The capital will be increased so as to take care of the conversion. The money is for the purpose of building a smelter.

The American Zinc, Lead and Smelting Company has organized the Wisconsin Zinc Company under Maine laws with $1,000,000 capital. The company will be a subsidiary, the American company controlling 60 per cent. of the stock and the former owners the balance. The property is in the Wisconsin zinc-lead district.

Montana Coal and Coke trust receipts have been put on the unlisted department of the exchange.

The curb has shown more activity, with hardening of prices.

STOCK QUOTATIONS

NEW YORK July 14		BOSTON July 14	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	½	Adventure	4⅛
Amalgamated	70	Allouez	30
Anaconda	44¼	Am. Zinc	‡28¼
Balaklala	‡⅜	Arcadian	3¼
British Col. Cop.	5	Arizona Com	19½
Butte & London	....	Atlantic	15
Butte Coalition	25	Bingham	.75
Colonial Silver	⅛	Boston Con	12
Cum. Ely Mining	8	Calumet & Ariz	113½
Davis Daly	2⅛	Calumet & Hecla	660¼
Dominion Cop	1⅛	Centennial	25
Douglas Copper	3⅞	Con. Mercur	‡.39
El Rayo	2	Copper Range	74
Florence	3 3/16	Daly West	11
Foster Cobalt	43	Franklin	9½
Furnace Creek	.15	Greene Can	10⅞
Giroux	3½	Isle Royal	20½
Gold Hill	⅛	La Salle	15
Goldfield Con	5 1/16	Mass	6
Granby	†96	Michigan	9½
Greene Gold	½	Mohawk	61⅛
Greene G. & S	3/16	Nevada	12½
Greenw'r & D.Val.	.75	North Butte	73¼
Guanajuato	1¾	Old Colony	‡.25
Gnggen. Exp.	150	Old Dominion	36⅛
Hanapah	‡.20	Osceola	100
McKinley Dar.	72	Parrot	24⅝
Micmac	2¾	Quincy	87½
Mines Co. of Am.	1½	Rhode Island	3⅜
Mitchell Mining	¼	Santa Fe	1⅞
Mont. Sho.C	‡.66	Shannon	14¼
Nev. Utah M. & S	2⅛	Superior	16¾
Newhouse M. & S	5½	Tamarack	65½
Nipissing Mines	7⅛	Trinity	13¾
Old Hundred	½	United Cop., com.	7
Silver Queen	1.05	U. S. Oil	24
Stewart	1/16	U. S. Smg. & Ref*.	36½
Tennessee Cop'r.	36	U.S.Sm. & Re.,pd*.	44
Tri-Bullion	1 1/16	Utah Con*	43⅜
Union Copper	1/16	Victoria	5½
Utah Apex	4	Winona	5⅞
Utah Copper	34	Wolverine	133
Yukon Gold	3¾	Wyandotte	1¼

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	24
Am. Smelt. & Ref.	83⅛
Am. Sm. & Ref., pf.	104
Bethlehem Steel	18½
Colo. Fuel & Iron	29¾
Federal M. & S.,pf.	‡83½
Inter. Salt	18½
National Lead	70⅜
National Lead, pf.	101¾
Pittsburg Coal	11½
Republic I. & S.	18¾
Republic I. & S.,pf.	69½
Sloss-Sheffield	59¼
Standard Oil	615
U. S. Red. & Ref.	‡10
U. S. Steel	42
U. S. Steel, pf	107⅞
Va. Car. Chem	24¾

BOSTON CURB	
Ahmeek	‡72½
Black Mt	3⅜
East Butte	‡6½
Hancock Con	‡5¾
Keweenaw	6¼
Majestic	.69
Raven	.95
Shawmut	.42
Superior & Pitts.	11⅛
Troy Man	.55

ST. LOUIS July 11		
N. of Com.	High.	Low.
Adams	.30	.20
Am. Nettie	.03	.02
Center Cr'k	2.00	1.50
Cent. C. & C.	68.00	67.00
C.C. & C. pd.	78 00	76.00
Cent. Oil	110.00	100.00
Columbia	4.00	3.00
Con. Coal	19.00	16.00
Doe Run	120.00	110.00
Gra. Bimet.	.22	.20
St. Joe	14.00	12.00

LONDON July 15	
Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 1 6
Camp Bird	0 13 0
Esperanza	1 12 6
Tomboy*	1 3 9
El Oro*	1 3 9
Oroville	0 10 6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. July 15.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.16
Belcher	.19	St. Ives	.30
Best & Belcher	.45	Triangle	.04
Caledonia	.07	BULLFROG STOCKS	
Challar	.15	Bullfrog Mining	.03
Comstock	.26	Bullfrog Nat. B.	.04
Con. Cal. & Va.	.57	Gibraltar	.05
Crown Point	.25	Gold Bar	.04
Exchequer	.17	Homestake King	.41
Gould & Curry	.11	Montgomery Mt.	.06
Hale & Norcross	.17	Mont. Shoshone C.	.70
Mexican	.45	Original Bullfrog	.01
Ophir	2.30	Tramp Cons	.18
Overman	.07	MANHAT'N STOCKS	
Potosi	.10	Manhattan Cons.	.08
Savage	.20	Manhat'n Dexter	.04
Sierra Nevada	.27	Jumping Jack	.03
Union	.24	Stray Dog	.02
Utah	.05	MISCELLANEOUS	
Yellow Jacket	.34	Golden Boulder	.07
TONOPAH STOCKS		Bonnie Clare	.07
Belmont	.84	Lee Gold Grotto	...
Extension	.65	Nevada Hills	1.75
Golden Anchor	.02	Nevada Smelting	.75
Jim Butler	.22	Pittsburgh S. Pk.	1.04
MacNamara	.34	Round Mt. Sphinx	.26
Midway	.36		
Montana	1.25		
North Star	.06		
Tono'h Mine of N.	7.75		
West End Con	.59		
GOLDFI'D STOCKS			
Adams	.03		
Atlanta	.18		
Booth	.15		
Columbia Mt	.14		
Comb. Frac	.68		
Cracker Jack	.04		
Dia'dfield B. B. C.	.18		
Goldfield Belmont	.14		
Goldfield Daisy	.80		
Great Bend	.26		
Jumbo Extension	.46		
Katherine	...		
Kendall	.12		
Lone Star	.06		
May Queen	.05		
Oro	.08		
Red Hill	.18		
Roanoke	...		
Sandstorm	.26		

COLO. SPRINGS July 11	
Name of Comp.	Clg.
Acacia	6
Black Bell	....
C. C. Con	3
Dante	7
Doctor Jack Pot	6¼
Elkton	56½
El Paso	31
Findlay	24½
Gold Dollar	6
Gold Sovereign	‡3
Isabella	27
Index	....
Jennie Sample	2¾
Jerry Johnson	‡4⅛
Mary McKinney	‡25
Pharmacist	2⅞
Portland	1 06
Un. Gold Mines	‡3½
Vindicator	85
Work	8⅝

Assessments

Company.	Delinq.	Sale.	Amt.
Birchville, Cal.	June 20	July 11	$0.02
Bullion, Nev.	June 25	July 17	0.05
Butler-Liberal, Utah	July 17	Aug. 6	0.02
Challar, Nev.	July 8	July 30	0.10
Con. Imperial, Nev.	June 17	July 9	0.01
Con. Virginia, Nev.	June 12	July 3	0.25
Confidence, Nev.	June 10	June 30	0.20
Helvetia, Ariz.	....	July 20	0.50
Lead King, Utah	July 1	July 28	0.01
Little Chief, Utah	June 17	July 7	0.01
Lucky Dutchman, Nev.	June 30	July 20	0.01
Mountain Dell, Utah	June 24	July 13	0.02
Oro Cobre, Cal.	July 16	Aug. 3	0.02
Overman, Nev	June 19	July 10	0.05
Peruvian Con., Utah	June 22	July 7	0.01
Silver King Con., Utah	June 11	June 30	0.10
Spanish Ridge, Cal.	June 1	July 1	0.05
Tomahawk, Nev	Julp 10	Aug. 12	0.01
Tonopah North Star, Nev.	June 24	....	0.01
Union Con., Nev.	June 15	July 9	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25 738
February	68.835	56.000	31.852	25.855
March	67.519	55 365	31.325	25 570
April	65.462	54.505	30.253	25.133
May	65.971	52.795	30.471	24.377
June	67.090	53.663	30.893	24.760
July	68.144	.....	31.366	.....
August	68.745	.....	31.637	.....
September	67.792	.....	31.313	.....
October	62.435	.....	28.863	.....
November	58 677	.....	27 154	.....
December	54.565	.....	25.362	.....
Year	65.327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62 386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12 743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	22.665	12.675	24.140	12.877	97.272	57.842
July	21.130	.....	21.923	.....	95.016	.....
August	18.356	.....	19.255	.....	79.679	.....
September	15.565	.....	16.047	.....	68.375	.....
October	13.169	.....	13.551	.....	60.717	.....
November	13.391	.....	13.870	.....	61.226	.....
December	13.163	.....	13.393	.....	60.113	.....
Year	20.004	.....	20.661	.....	87.007	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	.....
February	42.102	28.978	August	37.667	.....
March	41.313	30.577	September	36.689	.....
April	40.938	31.702	October	32.620	.....
May	43.149	30.015	November	30.833	.....
June	42.120	28.024	December	27.926	.....
			Av. year	38.166	.....

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19 828	14.469
February	6.000	3.725	19 531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.769	4.466	20.188	12.600
July	5.288	.....	20.350	.....
August	5.250	.....	19.063	.....
September	4.813	.....	19.775	.....
October	4.750	.....	18.531	.....
November	4.376	.....	17.281	.....
December	3.658	.....	14.500	.....
Year	5.325	.....	19.034	.....

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	4.543	6.269	4.393	25.469	19.000
July	6.072	.....	5.922	.....	23.850	.....
August	5.701	.....	5.551	.....	21 969	.....
September	5.236	.....	5.086	.....	21 050	.....
October	5.430	.....	5.280	.....	21.781	.....
November	4.925	.....	4.775	.....	21.438	.....
December	4.254	.....	4.104	.....	20.075	.....
Year	5.962	.....	5.812	.....	23.771	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.